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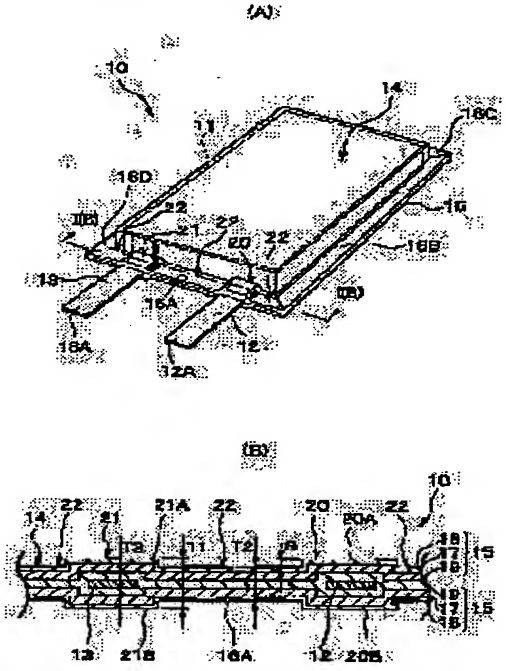
(54) SEALED BATTERY AND MANUFACTURING METHOD OF SEALED BATTERY

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a sealed battery. and a manufacturing method of the sealed battery, which can prevent short-circuiting between terminals led out of a welding margin and can make the margin thin.
SOLUTION: The sealed battery 10 contains a power-generating element 11 in a package 14 for the sealed battery so that a positive electrode terminal 12 and a negative electrode terminal 13 are exposed outside and seal the power- generating element 11 with a welding margin 16A which makes welding resin layers 19, 19 of the package 14 for the sealed battery welded with each other. At least at one side of the welding margin 16A, convex steps 20, 21 are provided corresponding to the positive electrode 12 and the negative electrode 13.



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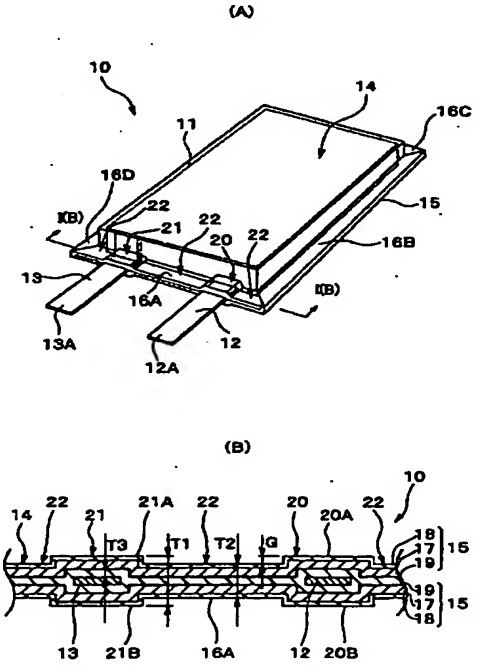
(54)【発明の名称】　密閉形電池および密閉形電池の製造方法

(57)【要約】
【課題】　融着代から引き出された端子同士の短絡を防止できるとともに、融着代を薄肉化できる密閉形電池および密閉形電池の製造方法を提供する。
【解決手段】　密閉形電池10は、正極端子12，負極端子13が外部露出するように、密閉形電池用パッケージ14内に発電要素11を収容し、密閉形電池用パッケージ14の融着性樹脂層19，19同士を互いに融着させる融着代16Aにより発電要素11を収容封止する。融着代16Aの少なくとも片面には、正極端子12，負極端子13に対応する凸状の段差部20，21を設ける。



1

【特許請求の範囲】

【請求項１】　電解質層を介して正極および負極が積層された発電要素と、前記正極および前記負極にそれぞれ連結された一対の端子と、前記各端子の開放端部が外部露出するように前記発電要素を収容する密閉形電池用パッケージとを有し、

前記密閉形電池用パッケージの内面に設けられた融着性樹脂層同士を互いに融着させる融着代により前記発電要素が収容封止された密閉形電池であって、

前記端子に対応して前記融着代の少なくとも片面に凸状の段差部が設けられていることを特徴とする密閉形電池。

【請求項２】　前記段差部が前記融着代の両面に設けられていることを特徴とする請求項１に記載した密閉形電池。

【請求項３】　前記段差部における前記融着性樹脂層の厚さ寸法が30μｍ以上であることを特徴とする請求項１に記載した密閉形電池。

【請求項４】　前記融着代の最大厚さ寸法と最小厚さ寸法との差が前記端子の厚さ寸法以上であることを特徴とする請求項１に記載した密閉形電池。

【請求項５】　正極および負極にそれぞれ接続した各端子の開放端部が外部露出するように発電要素を密閉形電池用パッケージ内に収容し、次いで前記発電要素を収容封止するために、一対の金型を介して前記密閉形電池用パッケージの融着代を加熱しながら挟持することにより前記密閉形電池用パッケージの内面に設けられた融着性樹脂層同士を互いに融着させる密閉形電池の製造方法であって、

前記端子に対応して前記金型の型面に設けた凹部により、前記融着代の少なくとも片面に凸状の段差部を形成することを特徴とする密閉形電池の製造方法。

【請求項６】　前記各金型の各型面にそれぞれ設けた前記凹部により、前記融着代の両面に前記段差部を形成することを特徴とする請求項５に記載した密閉形電池の製造方法。

【請求項７】　前記型面から突出型面を突出させることにより、前記融着代の少なくとも片面に凸状の段差部を形成することを特徴とする請求項５に記載した密閉形電池の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は密閉形電池および密閉形電池の製造方法に係り、特に融着代から引き出された端子同士の短絡を防止できるとともに、融着代を薄肉化できる密閉形電池および密閉形電池の製造方法に関する。

【０００２】

【従来の技術】図８（Ａ）に示すように、外装体に金属樹脂複合フィルムを用いた非水電解液系の密閉形電池80

2

は、電解質層を介して正極および負極が積層された発電要素81と、正極および負極にそれぞれ連結された正極端子82および負極端子83と、正極端子82の開放端部82Ａおよび負極端子83の開放端部83Ａが外部露出するように発電要素81を収容封止する密閉形電池用パッケージ84とを有している。このような密閉形電池80においては、電解質層の外部漏洩や外気の内部侵入を防ぐために、所定の樹脂フィルム85を筒状に形成した密閉形電池用パッケージ84に発電要素81を収容した後、密閉形電池用パッケージ84の両開口および余剰部分を加熱しながら厚さ方向に加圧して封口した平坦な融着代86Ａ，86Ｂ，86Ｃ，86Ｄにより発電要素81が収容封止される。

【０００３】図８（Ｂ）に示すように、樹脂フィルム85としては、アルミニウム箔製の金属箔芯材87と、金属箔芯材87の表面に沿うポリエチレンテレフタレート（PET）等のポリエステル樹脂やナイロン等のポリアミド樹脂、あるいはポリイミド樹脂製の保護層88と、金属箔芯材87の裏面に沿うポリプロピレン（PP）あるいはポリエチレン（PE）等のポリオレフィン系樹脂製の金属接着性を有する融着性樹脂層89とが積層された金属樹脂複合フィルムが多用される。

【０００４】図９に、正極端子82および負極端子83が引き出される融着代86Ａの形成工程を示す。まず、正極端子82および負極端子83を挟んで樹脂フィルム85の融着性樹脂層89同士が対向するように、密閉形電池用パッケージ84の開口縁部を上金型90および下金型91間に配置する（図９（Ａ）の状態）。上金型90および下金型91は、それぞれ平坦な型面90Ａ，91Ａが図示しない加温手段により所定温度に維持されている。

【０００５】次に、図示しないシール装置により上金型90および下金型91を相対的に近接させると、図９（Ｂ）に示すように、保護層88および金属箔芯材87を介して融着性樹脂層89が正極端子82および負極端子83の表裏に圧接する。この際、各融着性樹脂層89，89は、型面90Ａ，91Ａから保護層88および金属箔芯材87を介して伝播した熱により溶融を開始する。

【０００６】そして、図９（Ｃ）に示すように、上金型90および下金型91をさらに近接させると、各融着性樹脂層89，89における正極端子82および負極端子83と各金属箔芯材87，87との間の絶縁部92が厚さ方向に圧縮され、当該部分の各融着性樹脂層89が正極端子82および負極端子83の幅方向両端面側に流れるように溶融変形するとともに、各融着性樹脂層89，89の界面同士が相互に圧接される。このまま、上金型90および下金型91をさらに近接させると、正極端子82および負極端子83の幅方向両端面側を充塞しながら各融着性樹脂層89，89が全域にわたって薄膜化するとともに、各融着性樹脂層89，89の界面同士が融着される（図９（Ｄ）の状態）。そして、一定時間経過後に、上金型90および下金型91を離反させることにより所望の融着代86Ａを得る（図９（Ｅ）の状態）。

【０００７】なお、密閉形電池用パッケージ84は、例えば発電要素81を厚さ方向に挟むように略長方形の樹脂フィルム85，85を一対配置した後、各樹脂フィルム85，85の４辺に融着代を形成することにより発電要素81を収容封止してもよく、あるいは発電要素81を厚さ方向に挟むように樹脂フィルム85を２つ折りにした後、樹脂フィルム85の３辺に融着代を形成することにより発電要素81を収容封止してもよい。

【０００８】

【発明が解決しようとする課題】ところで、前述した密閉形電池80において、融着代86Aは、各融着性樹脂層89，89が溶融変形に伴って薄膜化するが、金属箔芯材87を介して正極端子82および負極端子83が短絡しないように、各融着性樹脂層89，89の厚さ寸法を一定以上に確保する必要がある。このため、従来の密閉形電池80において、密閉形電池用パッケージ84は、溶融変形に伴って薄膜化しても各融着性樹脂層89，89の厚さ寸法が所望値以上となるように、あらかじめの各融着性樹脂層89，89の厚さ寸法が全域にわたって一定以上に設定された樹脂フィルム85により形成されている。

【０００９】しかしながら、このような密閉形電池80は、融着性樹脂層89が全域にわたって厚膜化した樹脂フィルム85を採用しているため、当該密閉形電池80の最大厚さ寸法が大きくならざるを得ず、小型化，薄肉化が難しいとともに、融着性樹脂層89の厚さに応じて水分透過性やガス透過性が大きくなるため、外部から水分が侵入して電池性能の低下を引き起こしたり、発電要素81の電解質に用いられている有機溶媒ガスが失われて電池性能の低下を引き起こす虞れがある。

【００１０】また、このような密閉形電池80は、融着性樹脂層89が厚膜化しているため、融着代86Aの形成時に各融着性樹脂層89，89の界面が溶融温度に到達し難くい。従って、このような密閉形電池80は、各融着性樹脂層89，89の界面が充分に溶融せず、各融着性樹脂層89，89同士の融着強度が低くなる虞れもある。特に、各融着性樹脂層89，89の界面が充分に溶融しない場合、図８（Ｂ）中、二点鎖線により示すように、各融着性樹脂層89，89が正極端子82および負極端子83の幅方向両端面側を充塞できずに隙間93が生じ、密閉形電池80に充分な気密性が得られない虞れもある。

【００１１】本発明は、前述した問題点に鑑みてなされたものであり、その目的は融着代から引き出された端子同士の短絡を防止できるとともに、融着代を薄肉化できる密閉形電池および密閉形電池の製造方法を提供することにある。

【００１２】

【課題を解決するための手段】前述した目的を達成するために、本発明の密閉形電池は、請求項１に記載したように、電解質層を介して正極および負極が積層された発電要素と、前記正極および前記負極にそれぞれ連結された一対の端子と、前記各端子の開放端部が外部露出するように前記発電要素を収容する密閉形電池用パッケージとを有し、前記密閉形電池用パッケージの内面に設けられた融着性樹脂層同士を互いに融着させる融着代により前記発電要素が収容封止された密閉形電池であって、前記端子に対応して前記融着代の少なくとも片面に凸状の段差部が設けられていることを特徴としている。

【００１３】一方、本発明の密閉形電池の製造方法は、請求項５に記載したように、正極および負極にそれぞれ接続した各端子の開放端部が外部露出するように発電要素を密閉形電池用パッケージ内に収容し、次いで前記発電要素を収容封止するために、一対の金型を介して前記密閉形電池用パッケージの融着代を加熱しながら挟持することにより前記密閉形電池用パッケージの内面に設けられた融着性樹脂層同士を互いに融着させる密閉形電池の製造方法であって、前記端子に対応して前記金型の型面に設けた凹部により、前記融着代の少なくとも片面に凸状の段差部を形成することを特徴としている。

【００１４】ここで、各端子としては、帯状，棒状等に形成しておけばよく、互いの断面形状，平面形状，寸法等は個々に任意である。これらのような端子は、例えば平行、かつ、等間隔で多数のスリットを形成することにより所定の金属箔材を多数の短冊状に分割して製造してもよく、あるいは打抜，引抜，押出，鋳造，鍛造等の適宜な手段により製造してもよい。そして、段差部としては、例えば帯状の端子を採用した場合、端子の表面，裏面，幅方向両端面に対する融着性樹脂層の厚さ寸法を一定以上確保できればよく、融着代における発電要素側から周部側まで連続していればよい。具体的には、段差部は、端子の長手方向に対して直交する断面形状が例えば矩形状，半円形状，半長円形状等であればよい。

【００１５】このような段差部は、融着代の片面にのみ設けてもよく、あるいは融着代の両面に設けてもよい。なお、段差部を融着代の片面にのみ設ける場合、密閉形電池の最大厚さ寸法に影響を及ぼさない面を選択すればよい。

【００１６】また、本発明において、一方の端子に対しては融着代の片面に段差部を設け、他方の端子に対しては融着代の他面に段差部を設けてもよい。さらに、本発明において、一方の端子に対しては融着代の片面に段差部を設け、他方の端子に対しては融着代の両面に段差部を設けてもよい。

【００１７】これらのように構成された密閉形電池および密閉形電池の製造方法においては、端子に対応する段差部が融着代に設けられるため、段差部の高低差寸法を適宜選択すれば、端子と金属箔芯材との間における融着性樹脂層の厚さ寸法を一定以上確保できることになる。すなわち、これらの密閉形電池および密閉形電池の製造方法においては、従来のように、融着代の形成にあたって薄膜化されることを考慮して融着性樹脂層が厚膜化さ

れた密閉形電池用パッケージを採用する必要がなく、これにより密閉形電池を小型化，薄肉化できるとともに、各融着性樹脂層同士を確実に融着でき、かつ、充分な気密性が得られることになる。

【００１８】また、本発明の密閉形電池は、請求項２に記載したように、前記段差部が前記融着代の両面に設けられていることを特徴としている。一方、本発明の密閉形電池の製造方法は、請求項６に記載したように、前記各金型の各型面にそれぞれ設けた前記凹部により、前記融着代の両面に前記段差部を形成することを特徴としている。

【００１９】これらの密閉形電池および密閉形電池の製造方法においては、段差部が融着代の両面に設けられるため、融着代の形成時に、端子の位置ずれが生じ難く、これにより端子と金属箔芯材との間における融着性樹脂層の厚さ寸法を確実に一定以上確保できることになる。

【００２０】なお、本発明の密閉形電池の製造方法は、請求項７に記載したように、前記型面から突出型面を突出させることにより、前記融着代の少なくとも片面に凸状の段差部を形成してもよい。

【００２１】ところで、所定の板材に打抜加工を施して形成した端子を密閉形電池に採用した場合、端子の周部に生じたバリが融着性樹脂層を貫通して金属箔芯材に接触し、これにより各端子が短絡する可能性がある。そこで、本発明者は、打抜加工により形成した多数の端子の周部を詳細に観察し、バリの高さ寸法、すなわち端子本来の厚さ寸法と端子の実測最大厚さ寸法との差を集計した結果、密閉形電池に用いられるような薄肉の端子において、各バリの高さ寸法の最大値および平均値が20μｍ前後であることを見出した。

【００２２】そして、本発明者は、段差部における融着性樹脂層の厚さ寸法が、前述した20μｍとマージンとしての10μｍとの和である30μｍ以上であれば、各端子の周部にバリが生じていても各端子の短絡を確実に防止できると考察した。従って、本発明の密閉形電池は、請求項３に記載したように、前記段差部における前記融着性樹脂層の厚さ寸法が30μｍ以上であることを特徴としている。ここで、段差部における融着性樹脂層は、融着代の形成時に融着性樹脂層が溶融変形して薄膜化することを考慮して厚さ寸法が50μｍ以上であることが好ましく、かつ、界面が融着温度に達することを考慮して厚さ寸法が 100μｍ以下であることが好ましい。

【００２３】一方、本発明の密閉形電池において、金属箔芯材に対する端子の絶縁性を確保するためには、段差部における融着性樹脂層の膜厚が一定以上である必要がある。このため、本発明者は、融着代の最大厚さ寸法すなわち段差部の最大厚さ寸法と、融着代の最小厚さ寸法すなわち段差部が設けられていない平坦部の厚さ寸法との関係を考察した。その結果、箔状の端子を採用した場合、段差部の最大厚さ寸法が平坦部の厚さ寸法と端子の

厚さ寸法との和以上であれば、端子の周囲を一定以上の膜厚を有する各融着性樹脂層が被覆して確実な絶縁性が得られることを見出した。従って、本発明の密閉形電池は、請求項４に記載したように、前記融着代の最大厚さ寸法と最小厚さ寸法との差が前記端子の厚さ寸法以上であることを特徴としている。

【００２４】

【発明の実施の形態】以下、本発明に係る実施形態を図面に基づいて詳細に説明する。なお、以下に説明する各実施形態において、既に図８および図９において説明した部材等については、図中に同一符号あるいは相当符号を付すことにより説明を簡略化あるいは省略する。

【００２５】図１（Ａ）に示すように、本発明の第１実施形態である密閉形電池10は、電解質層を介して正極および負極が積層された発電要素11と、正極および負極にそれぞれ連結された箔状の正極端子12および負極端子13と、正極端子12の開放端部12Ａおよび負極端子13の開放端部13Ａが外部露出するように発電要素11を収容封止する密閉形電池用パッケージ14とを有している。正極端子12および負極端子13は、所定の箔材から打抜加工により形成された断面矩形状とされている。この密閉形電池10は、平面略長方形に形成された発電要素11の最大厚さ寸法が1.2mmないし 4.5mmとされている。

【００２６】図１（Ｂ）に示すように、密閉形電池用パッケージ14の樹脂フィルム15は、金属箔芯材17と、金属箔芯材17の表面に沿う保護層18と、金属箔芯材17の裏面に沿う融着性樹脂層19とが積層された金属樹脂複合フィルムが採用され、総厚さ寸法が70μｍないし 200μｍとされている。

【００２７】金属箔芯材17は、防湿性，成形性，保護性を得るためにアルミニウム箔が採用され、膜厚寸法が20μｍないし50μｍに設定されている。また、保護層18は、高強度，耐熱性，保護性を得るためにポリエチレンテレフタレート（ PET）等のポリエステル樹脂やナイロン等のポリアミド樹脂、あるいはポリイミド樹脂が採用され、膜厚寸法が６μｍないし50μｍに設定されている。そして、融着性樹脂層19は、耐熱性，防湿性，シール性を得るためにポリプロピレン（PP）あるいはポリエチレン（PE）等のポリオレフィン系樹脂が採用され、膜厚寸法が30μｍないし 100μｍに設定されている。

【００２８】このような密閉形電池10においては、電解質層の外部漏洩や外気の内部侵入を防ぐために、樹脂フィルム15を筒状に形成した密閉形電池用パッケージ14に発電要素11を収容した後、密閉形電池用パッケージ14の両開口および余剰部分を一対の金型により加熱しながら厚さ方向に加圧して封口した融着代16Ａ，16Ｂ，16Ｃ，16Ｄにより発電要素11が収容封止される。

【００２９】各融着代16Ａ，16Ｂ，16Ｃ，16Ｄは、それぞれの幅寸法が１mmないし10mmに設定されている。このような密閉形電池用パッケージ14は、各融着代16Ａ，16

B，16C，16Dを含む平面長辺寸法が30mmないし75mmとされ、平面短辺寸法が30mmないし50mmとされている。

【００３０】そして、融着代16Aには、本発明に基づいて段差部20，21が設けられている。段差部20は、正極端子12の配置位置に対応して、表裏融着代16Aの表裏に設けられた凸部20A，20Bを有している。凸部20A，20Bは、正極端子12を迂回するように、樹脂フィルム15の金属箔芯材17，保護層18および融着性樹脂層19を部分的に略クランク状に成形することにより設けられている。

【００３１】一方、段差部21も、負極端子13の配置位置に対応して、樹脂フィルム15の金属箔芯材17，保護層18および融着性樹脂層19を部分的に略クランク状に成形することにより、表裏融着代16Aの表裏に設けられた凸部21A，21Bを有している。これらの段差部20，21において、正極端子12および負極端子13の表面，裏面および幅方向両端面に接する融着性樹脂層19の厚さ寸法は、30μm以上に設定されている。

【００３２】これらの凸部20A，20B，21A，21Bは、融着代16Aにおける平坦部22に対する高低差寸法Gが正極端子12および負極端子13の厚さ寸法の半分以上となるように設定されている。すなわち、段差部20，21は、当該各段差部20，21の最大厚さ寸法T1と、平坦部22の最小厚さ寸法との差が正極端子12および負極端子13の厚さ寸法以上となっている。

【００３３】図２に、前述した融着代16Aの形成工程を示す。まず、正極端子12および負極端子13を挟んで樹脂フィルム15の融着性樹脂層19同士が対向するように、密閉形電池用パッケージ14の開口縁部を上金型30および下金型31間に配置する（図２（Ａ）の状態）。上金型30および下金型31は、それぞれの型面30A，31Aに凹部32，33，34，35が設けられている。これらの凹部32，33，34，35は、それぞれ前述した凸部20A，20B，21A，21Bに対応する位置に設けられていて、凸部20A，20B，21A，21Bの高低差寸法Gに対応する深さ寸法を有している。そして、これらの上金型30および下金型31は、図示しない加温手段により型面30A，31Aが所定温度に維持されている。

【００３４】次に、図示しないシール装置により上金型30および下金型31を相対的に近接させると、図２（Ｂ）に示すように、保護層18および金属箔芯材17を介して融着性樹脂層19が正極端子12および負極端子13の表裏に圧接する。この際、各融着性樹脂層19，19は、型面30A，31Aから保護層18および金属箔芯材17を介して伝播した熱により溶融を開始する。

【００３５】そして、図２（Ｃ）に示すように、上金型30および下金型31をさらに近接させると、各融着性樹脂層19，19の界面同士が相互に圧接される。この際、上金型30の型面30Aおよび下金型31の型面31Aにより厚さ方向に圧縮された各融着性樹脂層19，19は、正極端子12および負極端子13の幅方向両端面側を充塞しながら正極端子12および負極端子13の表裏側に流れるように溶融変形を開始する。

【００３６】このまま、上金型30および下金型31をさらに近接させると、金属箔芯材17，保護層18および融着性樹脂層19が部分的に略クランク状に変形しながら凹部32，33，34，35内に充填されるように成形されるとともに、各融着性樹脂層19，19の界面同士が融着される（図２（Ｄ）の状態）。この際、正極端子12および負極端子13は、それぞれ厚さ方向両側から凹部32，33，34，35に押さえ付けられるため、金属箔芯材17，保護層18および融着性樹脂層19を介して凹部32，33，34，35の均等中心位置に維持され、位置ずれが生じる虞れはない。

【００３７】また、正極端子12および負極端子13を被覆する各融着性樹脂層19は、正極端子12および負極端子13の表面，裏面および幅方向両端面に対する膜厚寸法がいずれも30μm以上となっている。そして、一定時間経過後に、上金型30および下金型31を離反させることにより、正極端子12および負極端子13に対応した位置に凸部20A，20B，21A，21Bが形成された所望の融着代16Aを得る（図２（Ｅ）の状態）。

【００３８】以上のような第１実施形態によれば、正極端子12および負極端子13に対応する段差部20，21が密閉形電池10の融着代16Aに設けられているため、段差部20，21の高低差寸法を適宜選択すれば、正極端子12および負極端子13と金属箔芯材17との間における融着性樹脂層19の厚さ寸法を一定以上確保できる。すなわち、この第１実施形態によれば、従来のように、融着代16Aの形成にあたって薄膜化されることを考慮して融着性樹脂層19が厚膜化された密閉形電池用パッケージ14を採用する必要がなく、これにより密閉形電池10を小型化，薄肉化できるとともに、各融着性樹脂層19，19同士を確実に融着でき、かつ、充分な気密性が得られる。

【００３９】特に、この第１実施形態によれば、融着代16Aの表裏にそれぞれ凸部20A，20B，21A，21Bを形成することにより段差部20，21を設けるため、融着代16Aの形成時に、正極端子12および負極端子13の位置ずれが生じ難く、これにより正極端子12および負極端子13と金属箔芯材17との間における融着性樹脂層19の厚さ寸法を確実に一定以上確保できる。

【００４０】また、前述した第１実施形態によれば、段差部20，21における融着性樹脂層19の厚さ寸法が30μm以上であるため、所定の板材に打抜加工を施して正極端子12および負極端子13を形成した場合であっても、正極端子12および負極端子13の周部に生じたバリが融着性樹脂層19を貫通して金属箔芯材17に接触する虞れを少なくできる。

【００４１】そして、このような第１実施形態によれば、融着代16Aの最大厚さ寸法T1と最小厚さ寸法T2との差が正極端子12および負極端子13の厚さ寸法以上であるため、平坦部22において融着した各融着性樹脂層19，19

の薄膜化が軽微な状態であれば段差部20，21における融着性樹脂層19の膜厚が一定以上得られ、これにより金属箔芯材17に対する正極端子12および負極端子13の絶縁性を確保できる。

【００４２】図３には、本発明に係る第２実施形態が示されている。なお、この第２実施形態は、前述した第１実施形態との相違点が段差部20，21の形成工程、すなわち融着代16Ａの形成工程であるため、融着代16Ａの形成工程のみを説明する。

【００４３】まず、正極端子12および負極端子13を挟んで樹脂フィルム15の融着性樹脂層19同士が対向するように、密閉形電池用パッケージ14の開口縁部を上金型40および下金型41間に配置する（図３（Ａ）の状態）。上金型40および下金型41は、それぞれ固定型面40Ａ，41Ａと突出型面40Ｂ，41Ｂとを有している。固定型面40Ａ，41Ａは、正極端子12および負極端子13に対応する位置に配置されている。一方、突出型面40Ｂ，41Ｂは、凸部20Ａ，20Ｂ，21Ａ，21Ｂの高低差寸法Ｇに対応して突出可能とされている。そして、これらの上金型40および下金型41は、図示しない加温手段により固定型面40Ａ，41Ａおよび突出型面40Ｂ，41Ｂが所定温度に維持されている。

【００４４】次に、図示しないシール装置により上金型40および下金型41を相対的に近接させると、図３（Ｂ）に示すように、保護層18および金属箔芯材17を介して融着性樹脂層19が正極端子12および負極端子13の表裏に圧接する。この際、各融着性樹脂層19，19は、固定型面40Ａ，41Ａおよび突出型面40Ｂ，41Ｂから保護層18および金属箔芯材17を介して伝播した熱により溶融を開始する。

【００４５】そして、図３（Ｃ）に示すように、固定型面40Ａ，41Ａに対して突出型面40Ｂ，41Ｂを突出させると、金属箔芯材17，保護層18および融着性樹脂層19が部分的に略クランク状に変形するとともに、各融着性樹脂層19，19が界面同士を相互に圧接しながら薄膜化され、かつ、各融着性樹脂層19，19の余剰分が正極端子12および負極端子13の幅方向両端面側を充塞するように溶融変形する。この際、正極端子12および負極端子13は、それぞれ対応する位置に固定型面40Ａ，41Ａが配置されているため、換言すれば当該正極端子12および負極端子13が突出型面40Ｂ，41Ｂの面方向中央に配置されているため、固定型面40Ａ，41Ａの均等中心位置に維持され、位置ずれが生じる虞れはない。

【００４６】また、正極端子12および負極端子13を被覆する各融着性樹脂層19は、正極端子12および負極端子13の表面，裏面および幅方向両端面に対する膜厚寸法がいずれも30μｍ以上となっている。そして、一定時間経過後に、上金型40および下金型41を離反させることにより、正極端子12および負極端子13に対応した位置に凸部20Ａ，20Ｂ，21Ａ，21Ｂが形成された所望の融着代16Ａを得る（図３（Ｄ）の状態）。

【００４７】このような第２実施形態によれば、前述した第１実施形態と同様に、正極端子12および負極端子13に対応する段差部20，21が密閉形電池10の融着代16Ａの両面に設けられているため、密閉形電池10を小型化，薄肉化できるとともに、各融着性樹脂層19，19同士を確実に融着でき、かつ、充分な気密性が得られる。

【００４８】そして、前述した第２実施形態によれば、融着代16Ａの形成にあたって、上金型40および下金型41の固定型面40Ａ，41Ａに対して突出型面40Ｂ，41Ｂを突出させることにより段差部20，21を設けるため、固定型面40Ａ，41Ａに対する突出型面40Ｂ，41Ｂの突出寸法を適宜選択すれば、各凸部20Ａ，20Ｂ，21Ａ，21Ｂの高低差寸法を任意に設定できる。すなわち、この第２実施形態によれば、正極端子12および負極端子13の断面形状，断面寸法が個々に異なる他の種類の密閉形電池に対して柔軟に対応できる。

【００４９】なお、本発明は、前述した各実施形態に限定されるものでなく、適宜な変形，改良等が可能であり、図４および図５に示す形態も本発明に含まれる。すなわち、図４に示す密閉形電池10Ａは、融着代46Ａにおける正極端子12および負極端子13に対応する片面にのみ凸部20Ａ，21Ａを形成することにより段差部40，41が設けられている。この場合、凸部20Ａ，21Ａは、密閉形電池10Ａの最大厚さ寸法に影響を及ぼさない面に形成することが望ましい。

【００５０】また、図５に示す密閉形電池10Ｂは、融着代56Ａにおける負極端子13に対応する片面に凸部21Ａを形成することにより段差部51が設けられているとともに、正極端子12に対応する他面に凸部20Ａを形成することにより段差部40が設けられている。

【００５１】そして、前述した各実施形態においては、断面矩形状の正極端子および負極端子を採用した密閉形電池が例示されていたが、図６に示す正極端子62および負極端子63を採用した密閉形電池10Ａも本発明に含まれる。すなわち、図６（Ａ）および図６（Ｂ）に示すように、正極端子62および負極端子63は、所定金属の棒材67をプレス金型18，19により径方向に圧縮変形させて断面略長円状に形成されている。そして、図６（Ｃ）に示すように、密閉形電池10Ａは、正極端子62および負極端子63の断面形状に対応して、融着代76Ａの両面に断面略半長円形状の凸部70Ａ，70Ｂ，71Ａ，71Ｂを形成することにより段差部70，71が設けられている。

【００５２】この密閉形電池10Ａによれば、金属棒材67を径方向に圧縮変形させた正極端子62および負極端子63を採用しているため、正極端子62および負極端子63の周部に生じるバリを考慮する必要がない。従って、このような密閉形電池10Ａによれば、融着性樹脂層19を薄膜化された樹脂フィルム64を採用できるため、総厚さ寸法を小さくでき、これにより一層小型化，薄肉化できる。

11

【００５３】その他、前述した各実施形態において例示した発電要素，正極端子，負極端子，密閉形電池用パッケージ，融着性樹脂層，融着代，段差部，金型，凹部，固定型面，突出型面等の材質，形状，寸法，形態，数，配置個所等は本発明を達成できるものであれば任意であり，限定されない。

【００５４】次に、融着代における段差部の厚さ寸法と平坦部の厚さ寸法との関係が本発明に基づくように製作＊

12

＊された複数種類の密閉形電池を実施例１ないし実施例３とし、段差部の厚さ寸法と平坦部の厚さ寸法との関係が本発明の特定範囲から外れるように製作された密閉形電池を比較例１として、正極端子および負極端子の短絡について調査した結果を表１に示す。

【００５５】

【表１】

	試料1	試料2	試料3	試料4	平均
A部のバリ高さ寸法(μm)	14.0	14.0	19.0	19.0	16.5
B部のバリ高さ寸法(μm)	14.0	19.0	19.0	19.0	17.8
C部のバリ高さ寸法(μm)	19.0	19.0	24.0	19.0	20.3
D部のバリ高さ寸法(μm)	14.0	19.0	21.0	19.0	18.3
平均	15.3	17.8	20.8	19.0	18.2

【００５６】なお、この調査に先立って、所定の箔材から打抜加工により形成された断面矩形状の試料を複数抜き出し、図７（Ａ）に示すように、幅方向端部４個所（ａ，ｂ，ｃ，ｄ）におけるバリの高さ寸法を測定した。図７（Ｂ）に示すように、バリの高さ寸法とは、試料本来の厚さ寸法と、端子の実測最大厚さ寸法との差を指す。これらの各試料におけるバリの高さ寸法を表２に示す。

【００５７】

【表２】

13　　14

	実施例1	実施例2	実施例3	比較例1
端子の厚み寸法（μm）	１００	１００	１００	１００
段差部の厚み寸法(μm)	３２７	３４１	２６６	２３３
平坦部の厚み寸法(μm)	１５８	１５６	１６３	１６４
端子同士の短絡	無	無	無（条件付）	有
段差部の融着強度	優	良	可	不良
総合評価	◎	○	△	×

【００５８】表１に戻って、実施例１ないし実施例３および比較例１に用いた樹脂フィルムは総厚さ寸法が１４０μｍであり、その組成は基本的に前述した第１実施形態と同様である。そして、これらの実施例１ないし実施例３および比較例１は、厚さ寸法が 100μｍの正極端子および負極端子を挟んで型面の表面を 190℃に維持した上金型および下金型を１Mpaの圧力で１秒ないし60秒圧着させ融着代を形成した。

【００５９】そして、これらの実施例１ないし実施例３および比較例１ついて、正極端子および負極端子の短絡の有無を評価するとともに、気密性を確認するために正極端子および負極端子に対する融着性樹脂層の融着強度を優・良・可・不良の四段階に評価し、これらの評価に基づいて総合評価を◎・○・△・×の四段階に評価した。

【００６０】（実施例１）段差部の厚さ寸法が３２７μｍであるとともに、平坦部の厚さ寸法が１５８μｍとなった。この実施例１では、正極端子および負極端子の短絡がないとともに、融着強度の評価が「優」であり、総合評価が「◎」であった。この実施例１は、上金型および下金型の圧着時間が60秒以上であっても正極端子および負極端子の短絡が生じなかった。

【００６１】（実施例２）段差部の厚さ寸法が３４１μｍであるとともに、平坦部の厚さ寸法が１５６μｍとなった。この実施例２では、正極端子および負極端子の短絡がないとともに、融着強度の評価が「良」であり、総合評価が「○」であった。この実施例２も、上金型および下金型の圧着時間が60秒以上であっても正極端子および負極端子の短絡が生じなかった。

【００６２】（実施例３）段差部の厚さ寸法が２６６μｍであるとともに、平坦部の厚さ寸法が１６３μｍとなった。この実施例３では、正極端子および負極端子の短絡がないとともに、融着強度の評価が「可」であり、総合評価が「△」であった。なお、この実施例３は、上金型および下金型の圧着時間が20秒以上であると正極端子および負極端子の短絡が発生したため、総合評価が「△」となった。

【００６３】（比較例１）段差部の厚さ寸法が２３３μｍであるとともに、平坦部の厚さ寸法が１６４μｍとなった。この比較例１では、上金型および下金型の圧着時間が５秒程度であっても正極端子および負極端子が短絡するとともに、融着性樹脂層が薄膜化して充分な融着強度が得られないため融着強度の評価が「不良」であり、総合評価が「×」であった。

15

【００６４】この表１において、実施例１ないし実施例３は、それぞれ段差部の厚さ寸法と平坦部の厚さ寸法との関係から、段差部における正極端子および負極端子と金属箔芯材との間の融着性樹脂層の厚さ寸法が30μｍ以上であると推察されるため、比較例１に比較して各評価が高いことが判る。特に、実施例１および実施例２は、段差部における融着性樹脂層の厚さ寸法が50μｍ以上であると推察されるため、実施例３に比較して正極端子および負極端子の短絡が無条件に達成でき、これにより高い評価となった。そして、実施例１は、段差部における融着性樹脂層の厚さ寸法が 100μｍ以下であると推察されるため、実施例２に比較して密閉形電池の小型化，薄肉化に貢献することが判る。

【００６５】以上のことから、本発明において、融着性樹脂層の厚さ寸法は、30μｍ以上が好ましく、さらに好ましくは50μｍ以上、一層好ましくは 100μｍ以下であることが判る。

【００６６】

【発明の効果】以上、説明したように、本発明によれば、請求項１および請求項５に記載したように、端子に対応する段差部が融着代に設けられるため、端子と金属箔芯材との間における融着性樹脂層の厚さ寸法を一定以上確保でき、これにより密閉形電池を小型化，薄肉化できるとともに、各融着性樹脂層同士を確実に融着でき、かつ、充分な気密性が得られる。

【００６７】また、本発明によれば、請求項２および請求項６に記載したように、段差部が融着代の両面に設けられるため、融着代の形成時に、端子の位置ずれが生じ難く、これにより端子と金属箔芯材との間における融着性樹脂層の厚さ寸法を確実に一定以上確保できる。

【００６８】さらに、本発明の密閉形電池によれば、請求項３に記載したように、段差部における融着性樹脂層の厚さ寸法が30μｍ以上であるため、密閉形電池に用いられるような薄肉の端子を打抜加工により形成した場合であっても、端子の周部に生じたバリによる各端子の短絡を防止できる。そして、本発明の密閉形電池によれば、請求項４に記載したように、融着代の最大厚さ寸法と最小厚さ寸法との差が端子の厚さ寸法以上であるた＊

16

＊め、段差部における融着性樹脂層の膜厚が一定以上確保でき、これにより金属箔芯材に対する確実な端子の絶縁性が得られる。

【００６９】また、本発明の密閉形電池の製造方法によれば、請求項７に記載したように、型面から突出型面を突出させることにより、融着代の少なくとも片面に凸状の段差部を形成するため、突出型面の突出寸法を適宜選択すれば、各端子の断面形状，断面寸法が個々に異なる他の種類の密閉形電池に対して柔軟に対応できる。

【図面の簡単な説明】

【図１】本発明に係る第１実施形態を示す全体斜視図および要部拡大断面図である。

【図２】第１実施形態における融着代の形成工程を示す断面図である。

【図３】本発明に係る第２実施形態における融着代の形成工程を示す断面図である。

【図４】本発明の変形例を示す要部拡大断面図である。

【図５】本発明の変形例を示す要部拡大断面図である。

【図６】本発明の変形例を示す模式断面図および要部拡大断面図である。

【図７】バリの高さ寸法の最大値および平均値を算出した作業を示す模式図である。

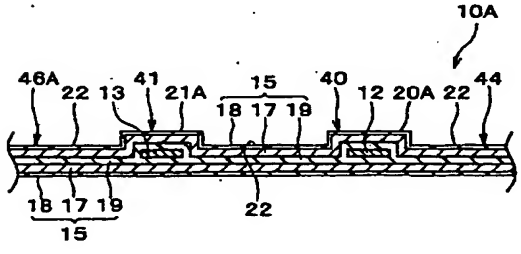
【図８】従来の密閉型電池を示す全体斜視図および要部拡大断面図である。

【図９】従来の融着代の形成工程を示す断面図である。

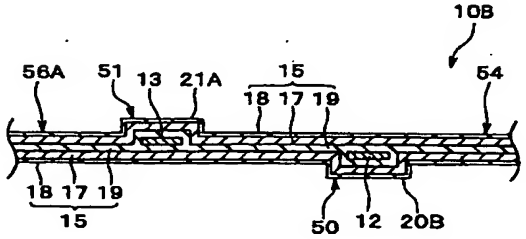
【符号の説明】

10，10A，10B，10C　密閉形電池
11　発電要素
12，62　正極端子
13，63　負極端子
14，44，54，64　密閉形電池用パッケージ
19　融着性樹脂層，
16A，46A，56A，76A　融着代
20，21，40，41，50，51，70，71　段差部
30，31，40，41　金型
31，32，33，34　凹部
40A，41A　固定型面
40B，41B　突出型面

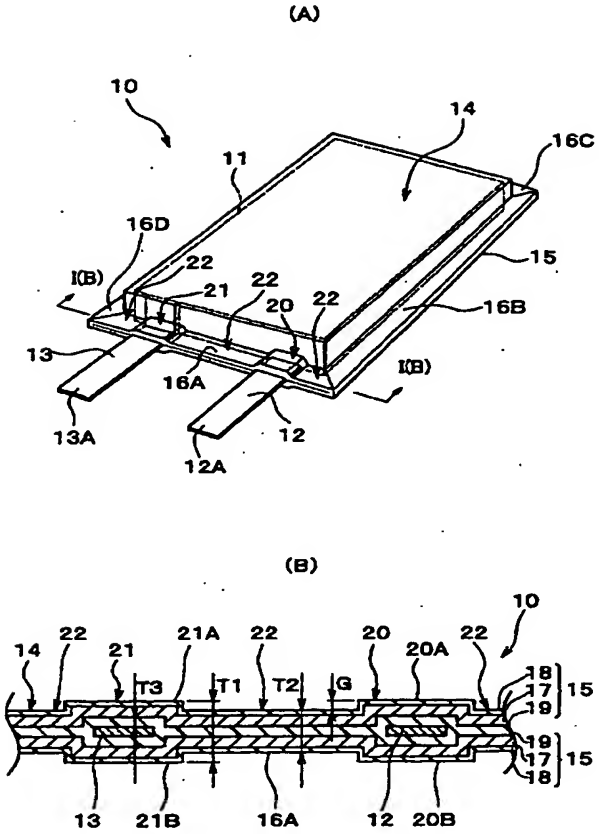
【図４】



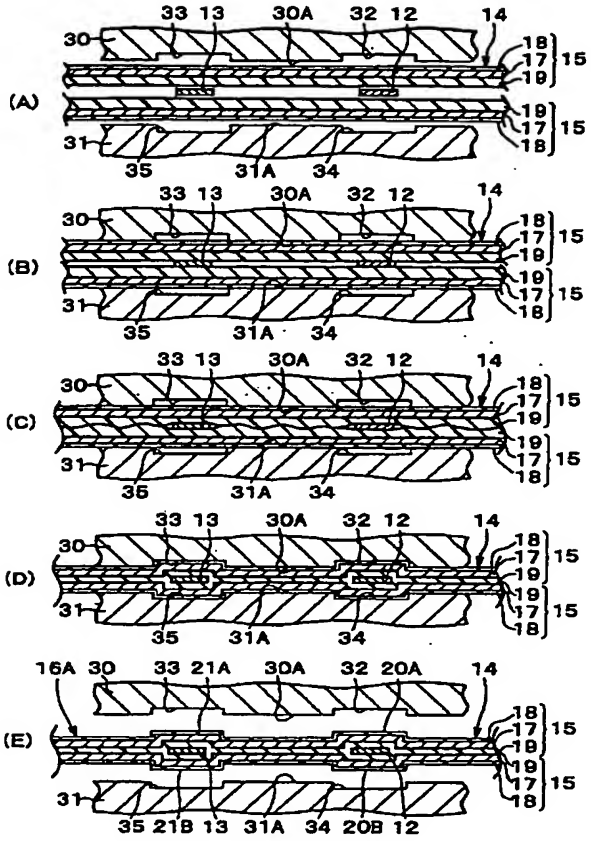
【図５】



【図１】


(A)
10
14
16C
11
16D
22
I(B)
21
22
20
22
15
16B
13
16A
I(B)
13A
12
12A
(B)
10
14
22
21
21A
22
20
20A
22
T3
T1
T2
G
18
17
19
15
19
17
18
15
13
21B
16A
12
20B

【図２】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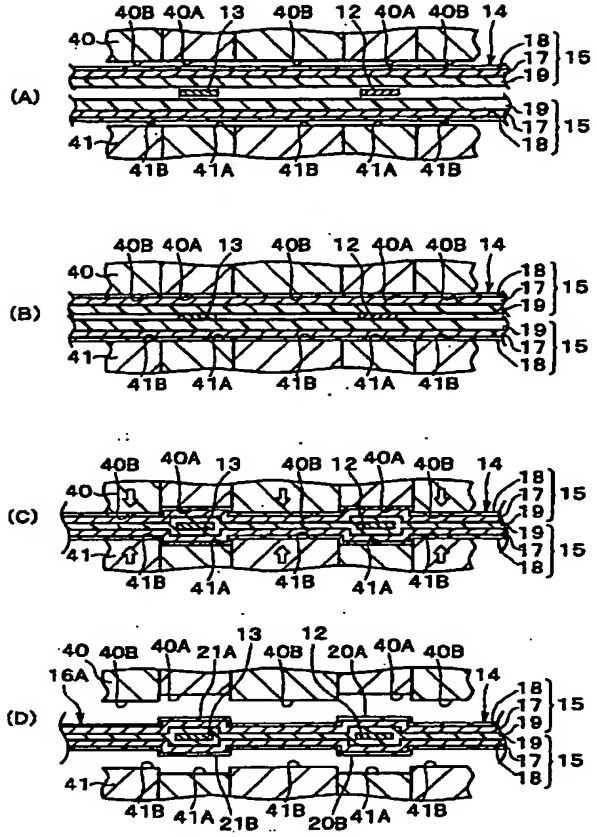
33 13
30A
32 12
14
30
18
17
19
15
19
17
18
15
31
35
31A
34
(B)
(C)
(D)
(E)
16A 30
33 21A
30A
32 20A
35 21B 13 31A 34 20B 12

【図３】


(A)
(B)
(C)
(D)
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40
41
18
17
19
15
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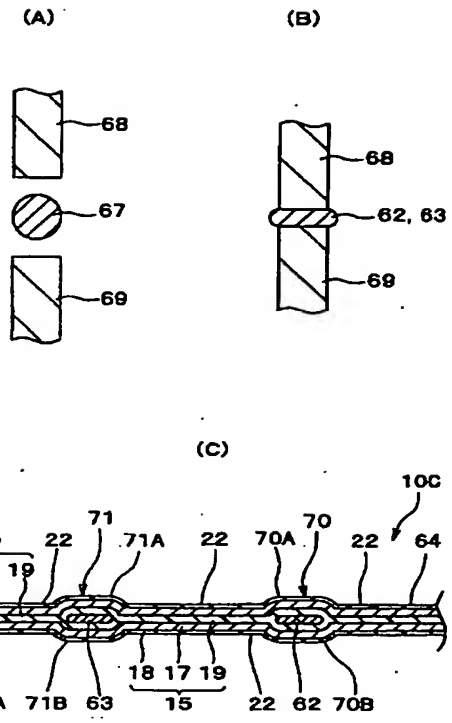
16A
14
41B 41A 21B 41B 20B 41A 41B

【図６】


(A)
(B)
(C)
68
67
69
62, 63
10C
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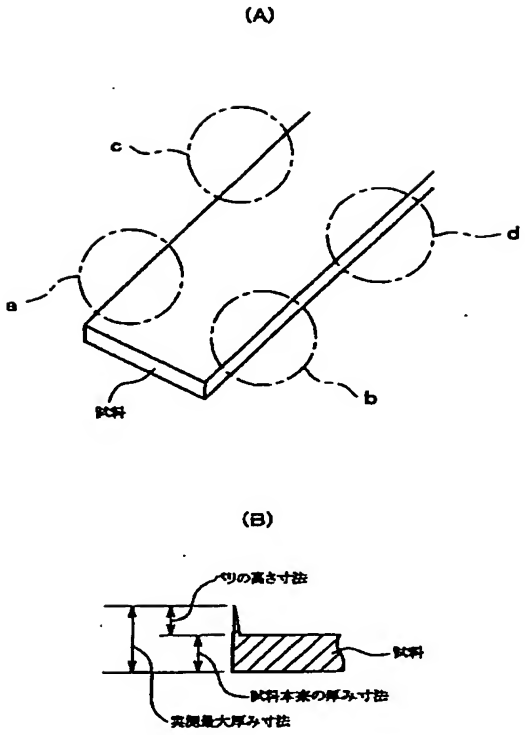
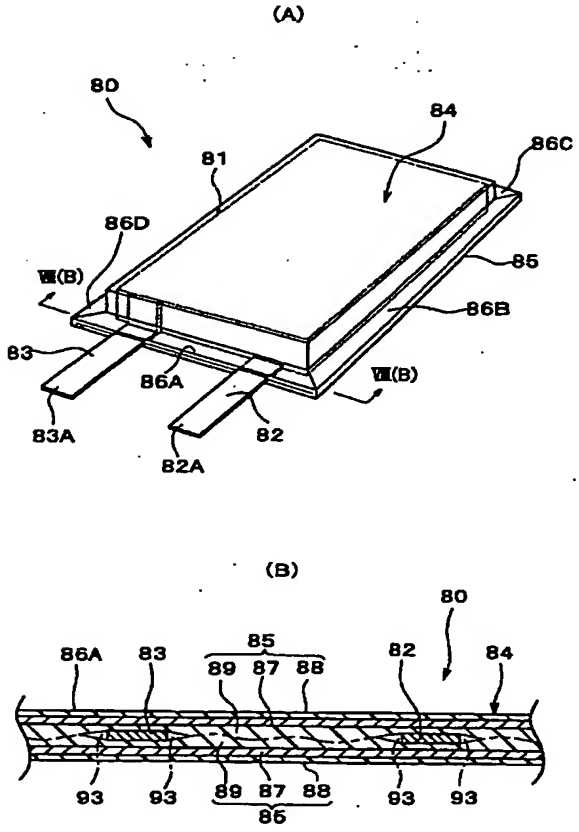
70
15
22
71A
70A
64
18 17 19
76A
71B
63
62
70B

【図７】


(A)
c
d
a
b
試料
(B)
バリの高さ寸法
試料
試料本来の厚み寸法
実現最大厚み寸法

【図８】


(A)
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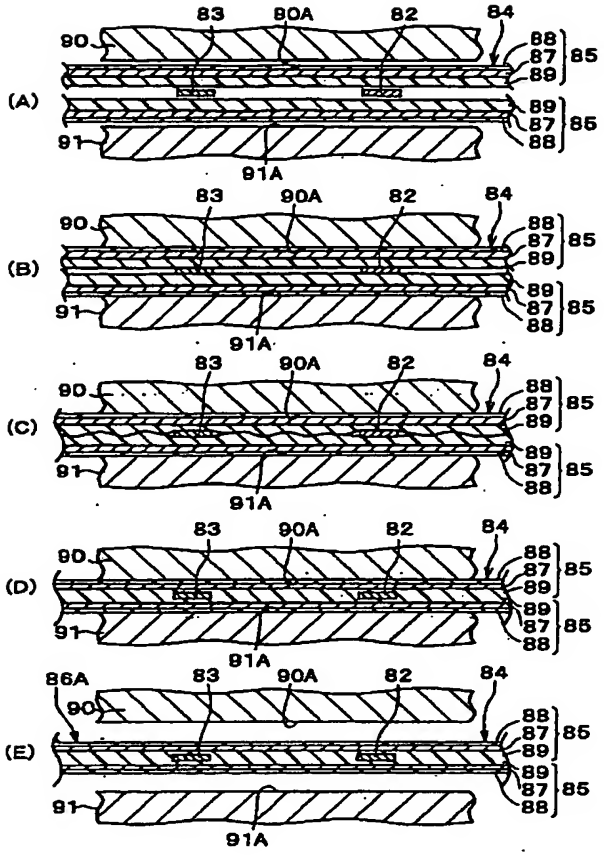
84
86C
81
86D
85
面(B)
86B
83
86A
面(B)
83A
82
82A
(B)
80
86A
83
85
89
87
88
82
84
93
93
89
87
88
93
93
86

【図９】



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The generation-of-electrical-energy element with which the laminating of a positive electrode and the negative electrode was carried out through the electrolyte layer, and the terminal of a pair connected with said positive electrode and said negative electrode, respectively, It has the package for sealing form cells which holds said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure. The sealing form cell which is a sealing form cell by which the hold closure of said generation-of-electrical-energy element was carried out by the welding cost to which welding of the welding nature resin layers prepared in the inside of said package for sealing form cells is carried out mutually, and is characterized by preparing the convex level difference section at least in one side of said welding cost corresponding to said terminal.
[Claim 2] The sealing form cell indicated to claim 1 characterized by preparing said level difference section in both sides of said welding cost.
[Claim 3] The sealing form cell indicated to claim 1 characterized by the thickness dimension of said welding nature resin layer in said level difference section being 30 micrometers or more.
[Claim 4] The sealing form cell indicated to claim 1 characterized by the difference of the maximum thickness dimension of said welding cost and the minimum thickness dimension being more than the thickness dimension of said terminal.
[Claim 5] In order to hold a generation-of-electrical-energy element in the package for sealing form cells so that the open end section of each terminal connected to the positive electrode and the negative electrode, respectively may carry out external exposure, and to carry out hold closure of said generation-of-electrical-energy element subsequently It is the manufacture approach of the sealing form cell to which welding of the welding nature resin layers prepared in the inside of said package for sealing form cells by pinching heating the welding cost of said package for sealing form cells through the metal mold of a pair is carried out mutually. The manufacture approach of the sealing form cell characterized by forming the convex level difference section at least in one side of said welding cost by the crevice established in the mold face of said metal mold corresponding to said terminal.
[Claim 6] The manufacture approach of the sealing form cell indicated to claim 5 characterized by forming said level difference section in both sides of said welding cost by said crevice established in each mold face of each of said metal mold, respectively.
[Claim 7] The manufacture approach of the sealing form cell indicated to claim 5 characterized by forming the convex level difference section at least in one side of said welding cost by making a projecting type side project from said mold face.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the sealing form cell which can carry out the thinning of the welding cost, and a sealing form cell while being able to prevent the short circuit of the terminals which started the manufacture approach of a sealing form cell and a sealing form cell, especially were pulled out from welding cost.
[0002]
[Description of the Prior Art] As shown in drawing 8 (A), the sealing form cell 80 of the nonaqueous electrolyte system which used the metal resin complex film for the sheathing object The generation-of-electrical-energy element 81 with which the laminating of a positive electrode and the negative electrode was carried out through the electrolyte layer, and the positive-electrode terminal 82 and the negative-electrode terminal 83 connected with the positive electrode and the negative electrode, respectively, It has the package 84 for sealing form cells which carries out hold closure of the generation-of-electrical-energy element 81 so that open end section 82A of the positive-electrode terminal 82 and open end section 83A of the negative-electrode terminal 83 may carry out external exposure. In such a sealing form cell 80, in order to prevent external leakage of an electrolyte layer, and internal invasion of the open air After holding the generation-of-electrical-energy element 81 in the package 84 for sealing form cells which formed the predetermined resin film 85 in tubed, The hold closure of the generation-of-electrical-energy element 81 is carried out by the flat welding cost 86A, 86B, 86C, and 86D which pressurized in the thickness direction and obturated, heating double door opening and the surplus part of the package 84 for sealing form cells.
[0003] As shown in drawing 8 (B), as a resin film 85 The protective layer 88 of polyamide resin, such as polyester resin, such as polyethylene terephthalate (PET) along the front face of the metallic foil core material 87 made from aluminium foil, and the metallic foil core material 87, and nylon, or the product made of polyimide resin, The metal resin complex film with which the laminating of the welding nature resin layer 89 which has a metal adhesive property made of polyolefine system resin, such as polypropylene (PP) along the rear face of the metallic foil core material 87 or polyethylene (PE), was carried out is used abundantly.
[0004] The formation process of welding cost 86A with which the positive-electrode terminal 82 and the negative-electrode terminal 83 are pulled out by drawing 9 is shown. First, the opening edge of the package 84 for sealing form cells is arranged between the upper metal mold 90 and the Shimokane mold 91 so that welding nature resin layer 89 comrades of the resin film 85 may counter on both sides of the positive-electrode terminal 82 and the negative-electrode terminal 83 (condition of drawing 9 (A)). warming whose respectively flat mold faces 90A and 91A do not illustrate the upper metal mold 90 and the Shimokane mold 91 -- it is maintained by predetermined temperature with the means.
[0005] Next, if the upper metal mold 90 and the Shimokane mold 91 are made to approach relatively with the sealing device which is not illustrated, as shown in drawing 9 (B), the welding nature resin layer 89 will carry out a pressure welding to the front flesh side of the positive-electrode terminal 82 and the negative-electrode terminal 83 through a protective layer 88 and the metallic foil core material 87. Under the present circumstances, each welding nature resin layers 89 and 89 start melting with the heat spread through the protective layer 88 and the metallic foil core material 87

from mold faces 90A and 91A.
[0006] And if the upper metal mold 90 and the Shimokane mold 91 are made to approach further as shown in drawing 9 (C) The insulating section 92 between the positive-electrode terminal 82 and the negative-electrode terminal 83 in each welding nature resin layers 89 and 89, and each metallic foil core materials 87 and 87 is compressed in the thickness direction. While carrying out melting deformation so that each welding nature resin layer 89 of the part concerned may flow to the crosswise both-ends side side of the positive-electrode terminal 82 and the negative-electrode terminal 83, the pressure welding of the interfaces of each welding nature resin layers 89 and 89 is carried out mutually. If the upper metal mold 90 and the Shimokane mold 91 are made to approach further as it is, while each welding nature resin layers 89 and 89 will thin-film-ize over the whole region, being filled with the crosswise both-ends side side of the positive-electrode terminal 82 and the negative-electrode terminal 83, welding of the interfaces of each welding nature resin layers 89 and 89 is carried out (condition of drawing 9 (D)). And desired welding cost 86A is obtained by making the upper metal mold 90 and the Shimokane mold 91 desert after fixed time amount progress (condition of drawing 9 (E)).
[0007] The package 84 for sealing form cells In addition, after [for example,] carrying out pair arrangement of the resin films 85 and 85 of an abbreviation rectangle so that the generation-of-electrical-energy element 81 may be pinched in the thickness direction, Hold closure of the generation-of-electrical-energy element 81 may be carried out by forming welding cost in four sides of each resin films 85 and 85. Or after using the resin film 85 as 2 chip boxes so that the generation-of-electrical-energy element 81 may be pinched in the thickness direction, hold closure of the generation-of-electrical-energy element 81 may be carried out by forming welding cost in three sides of the resin film 85.
[0008]
[Problem(s) to be Solved by the Invention] By the way, in the sealing form cell 80 mentioned above, although each welding nature resin layers 89 and 89 thin-film-ize welding cost 86A in connection with melting deformation, it needs to secure the thickness dimension of each welding nature resin layers 89 and 89 more than fixed so that the positive-electrode terminal 82 and the negative-electrode terminal 83 may not short-circuit through the metallic foil core material 87. for this reason, in the conventional sealing form cell 80, even if it thin-film-izes the package 84 for sealing form cells in connection with melting deformation, the thickness dimension of each welding nature resin layers 89 and 89 becomes beyond a request value -- as -- oh, it is formed with the resin film 85 with which the thickness dimension of each welding nature resin layers 89 and 89 of an Ecklonia was set up over the whole region more than fixed.
[0009] However, such a sealing form cell 80 since the resin film 85 which the welding nature resin layer 89 thick-film-ized over the whole region is adopted -- the maximum thickness dimension of the sealing form cell 80 concerned -- large -- not becoming -- it not obtaining, but, while a miniaturization and thinning are difficult Since moisture permeability and gas permeability become large according to the thickness of the welding nature resin layer 89, moisture invades from the exterior, cell performance degradation is caused or there is a possibility of the organic solvent gas used for the electrolyte of the generation-of-electrical-energy element 81 being lost, and causing cell performance degradation.
[0010] Moreover, since the welding nature resin layer 89 has thick-film-ized, the interface of each welding nature resin layers 89 and 89 reaches melting temperature at the time of formation of welding cost 86A, and such a sealing form cell 80 is a difficulty pile. Therefore, the interface of each welding nature resin layers 89 and 89 does not fully fuse such a sealing form cell 80, but it also has a possibility that the welding reinforcement of each welding nature resin layer 89 and 89 comrades may become low. When the interface of each welding nature resin layers 89 and 89 does not fully fuse especially, a clearance 93 is generated without the ability filling each welding nature resin layers 89 and 89 with the crosswise both-ends side side of the positive-electrode terminal 82 and the negative-electrode terminal 83, and there is also a possibility that sufficient airtightness for the sealing form cell 80 may not be acquired so that a two-dot chain line may show among drawing 8 (B).
[0011] This invention is made in view of the trouble mentioned above, and the purpose is to offer the

manufacture approach of the sealing form cell which can carry out the thinning of the welding cost, and a sealing form cell while being able to prevent the short circuit of the terminals pulled out from welding cost.

[0012]

[Means for Solving the Problem] In order to attain the purpose mentioned above, the sealing form cell of this invention The generation-of-electrical-energy element with which the laminating of a positive electrode and the negative electrode was carried out through the electrolyte layer as indicated to claim 1, It has the terminal of a pair connected with said positive electrode and said negative electrode, respectively, and the package for sealing form cells which holds said generation-of-electrical-energy element so that the open end section of each of said terminal may carry out external exposure. It is the sealing form cell by which the hold closure of said generation-of-electrical-energy element was carried out by the welding cost to which welding of the welding nature resin layers prepared in the inside of said package for sealing form cells is carried out mutually, and is characterized by preparing the convex level difference section at least in one side of said welding cost corresponding to said terminal.

[0013] On the other hand, as indicated to claim 5, the manufacture approach of the sealing form cell of this invention In order to hold a generation-of-electrical-energy element in the package for sealing form cells so that the open end section of each terminal connected to the positive electrode and the negative electrode, respectively may carry out external exposure, and to carry out hold closure of said generation-of-electrical-energy element subsequently It is the manufacture approach of the sealing form cell to which welding of the welding nature resin layers prepared in the inside of said package for sealing form cells by pinching heating the welding cost of said package for sealing form cells through the metal mold of a pair is carried out mutually. By the crevice established in the mold face of said metal mold corresponding to said terminal, it is characterized by forming the convex level difference section at least in one side of said welding cost.

[0014] Here, as each terminal, the mutual cross-section configuration, the flat-surface configuration, the dimension, etc. are [that what is necessary is just to form in band-like and cylindrical **] separately arbitrary. By forming many slits by parallel and regular intervals, predetermined metallic foil material may be divided in the shape of [much] a strip of paper, and these terminals [like] may manufacture it, or may manufacture it with a means with proper punching , drawing out, extrusion, casting, forging, etc. And what is necessary is just to follow the periphery side from the generation-of-electrical-energy element side in welding cost that what is necessary is just to be able to secure the thickness dimension of the welding nature resin layer to the front face of a terminal, a rear face, and a crosswise both-ends side more than fixed, when a band-like terminal is adopted as the level difference section, for example. Specifically, the cross-section configurations configurations and the level difference section cross at right angles to the longitudinal direction of a terminal should just be the shape of the shape for example, of a rectangle, and a hemicycle, a half-ellipse configuration, etc.

[0015] Such the level difference section may be prepared only in one side of welding cost, or may be prepared in both sides of welding cost. In addition, what is necessary is just to choose the field which does not affect the maximum thickness dimension of a sealing form cell, when preparing the level difference section only in one side of welding cost.

[0016] moreover, in this invention, to one terminal, the level difference section is prepared in one side of welding cost, on the other hand to an other-end child, welding cost may be alike, and the level difference section may be prepared. Furthermore, in this invention, to one terminal, the level difference section may be prepared in one side of welding cost, and the level difference section may be prepared in both sides of welding cost to an other-end child.

[0017] In the manufacture approach of these sealing form cells constituted like and a sealing form cell, since the level difference section corresponding to a terminal is prepared in welding cost, if the difference-of-elevation dimension of the level difference section is chosen suitably, the thickness dimension of the welding nature resin layer between a terminal and a metallic foil core material can be secured more than fixed. That is, in the manufacture approach of these sealing form cells and a sealing form cell, while not adopting the package for sealing form cells with which the welding nature resin layer was thick-film-ized, miniaturizing and being able to carry out the thinning of the sealing form cell by this in consideration of being thin-film-ized in formation of welding cost like

before, each welding nature resin layers can be welded certainly, and sufficient airtightness will be acquired.

[0018] Moreover, the sealing form cell of this invention is characterized by preparing said level difference section in both sides of said welding cost, as indicated to claim 2. On the other hand, the manufacture approach of the sealing form cell of this invention is characterized by forming said level difference section in both sides of said welding cost by said crevice established in each mold face of each of said metal mold, respectively, as indicated to claim 6.

[0019] In the manufacture approach of these sealing form cells and a sealing form cell, since the level difference section is prepared in both sides of welding cost, it will be hard to produce a location gap of a terminal at the time of formation of welding cost, and the thickness dimension of the welding nature resin layer between a terminal and a metallic foil core material can be secured more than fixed certainly by this.

[0020] In addition, the manufacture approach of the sealing form cell of this invention may form the convex level difference section at least in one side of said welding cost by making a projecting type side project from said mold face, as indicated to claim 7.

[0021] By the way, when the terminal which performed and formed blanking in the predetermined plate is adopted as a sealing form cell, the weld flash produced in the periphery of a terminal may penetrate a welding nature resin layer, a metallic foil core material may be contacted, and, thereby, each terminal may short-circuit. Then, this invention person found out that the maximum and the average of a height dimension of each weld flash were around 20 micrometers in the terminal of thin meat which is used for a sealing form cell, as a result of observing in a detail the periphery of the terminal of a large number formed by blanking and totaling a difference with the height dimension of weld flash, i.e., the thickness dimension of terminal original, and the observation maximum thickness dimension of a terminal.

[0022] And when the thickness dimension of the welding nature resin layer in the level difference section was 30 micrometers or more which is the sum (20 micrometers mentioned above and 10 micrometers) as a margin, this invention person considered that the short circuit of each terminal could be prevented certainly, even if weld flash had arisen in the periphery of each terminal. Therefore, the sealing form cell of this invention is characterized by the thickness dimension of said welding nature resin layer in said level difference section being 30 micrometers or more, as indicated to claim 3. Here, in consideration of it being desirable that a thickness dimension is 50 micrometers or more, and an interface reaching welding temperature in consideration of a welding nature resin layer carrying out melting deformation, and thin-film-izing at the time of formation of welding cost, a thickness dimension the welding nature resin layer in the level difference section It is desirable that it is 100 micrometers or less.

[0023] On the other hand, in the sealing form cell of this invention, in order to secure the insulation of the terminal to a metallic foil core material, the thickness of the welding nature resin layer in the level difference section needs to be more than fixed. For this reason, this invention person considered the relation between the maximum thickness dimension of welding cost, i.e., the maximum thickness dimension of the level difference section, and the thickness dimension of the flat part in which it is not prepared, the minimum thickness dimension, i.e., the level difference section, of welding cost. Consequently, when a foil-like terminal was adopted and the maximum thickness dimension of the level difference section was more than the sum of the thickness dimension of a flat part, and the thickness dimension of a terminal, it found out that each welding nature resin layer which has the thickness more than fixed covered the perimeter of a terminal, and positive insulation was acquired. Therefore, the sealing form cell of this invention is characterized by the difference of the maximum thickness dimension of said welding cost and the minimum thickness dimension being more than the thickness dimension of said terminal, as indicated to claim 4.

[0024]

[Embodiment of the Invention] Hereafter, the operation gestalt concerning this invention is explained to a detail based on a drawing. In addition, in each operation gestalt explained below, explanation is simplified or omitted by attaching the same sign or a considerable sign all over drawing about the member already explained in drawing 8 and drawing 9 .

[0025] As shown in drawing 1 (A), the sealing form cell 10 which is the 1st operation gestalt of this

invention The generation-of-electrical-energy element 11 with which the laminating of a positive electrode and the negative electrode was carried out through the electrolyte layer, and foil-like the positive-electrode terminal 12 and the negative-electrode terminal 13 connected with the positive electrode and the negative electrode, respectively, It has the package 14 for sealing form cells which carries out hold closure of the generation-of-electrical-energy element 11 so that open end section 12A of the positive-electrode terminal 12 and open end section 13A of the negative-electrode terminal 13 may carry out external exposure. The positive-electrode terminal 12 and the negative-electrode terminal 13 are made into the shape of a cross-section rectangle formed of blanking from predetermined foil material. ** [as for this sealing form cell 10, the maximum thickness dimension of the generation-of-electrical-energy element 11 formed in the flat-surface abbreviation rectangle does not have 1.2mm] It may be 4.5mm.

[0026] As shown in drawing 1 (B), ** [the metal resin complex film with which the laminating of the protective layer 18 to which the resin film 15 of the package 14 for sealing form cells is along the front face of the metallic foil core material 17 and the metallic foil core material 17, and the welding nature resin layer 19 along the rear face of the metallic foil core material 17 was carried out is adopted and the total thickness dimension does not have 70 micrometers] It may be 200 micrometers.

[0027] In order that the metallic foil core material 17 may obtain dampproofing, a moldability, and protection nature, aluminium foil is adopted, and the thickness dimension is set as 20 micrometers thru/or 50 micrometers. Moreover, in order that a protective layer 18 may obtain high intensity, thermal resistance, and protection nature, polyamide resin, such as polyester resin, such as polyethylene terephthalate (PET), and nylon, or polyimide resin is adopted, and the thickness dimension is set as 6 micrometers thru/or 50 micrometers. and in order to obtain thermal resistance, dampproofing, and seal nature, polyolefine system resin, such as polypropylene (PP) or polyethylene (PE), adopts the welding nature resin layer 19 -- having -- a thickness dimension -- 30 micrometers -- or -- It is set as 100 micrometers.

[0028] In such a sealing form cell 10, in order to prevent external leakage of an electrolyte layer, and internal invasion of the open air After holding the generation-of-electrical-energy element 11 in the package 14 for sealing form cells which formed the resin film 15 in tubed, The hold closure of the generation-of-electrical-energy element 11 is carried out by the welding cost 16A, 16B, 16C, and 16D which pressurized in the thickness direction and obturated, heating double door opening and the surplus part of the package 14 for sealing form cells with the metal mold of a pair.

[0029] As for each welding cost 16A, 16B, 16C, and 16D, the width method of ******** is set as 1mm thru/or 10mm. The flat-surface long side dimension in which such a package 14 for sealing form cells contains each welding cost 16A, 16B, 16C, and 16D is set to 30mm thru/or 75mm, and the flat-surface shorter side dimension is set to 30mm thru/or 50mm.

[0030] And based on this invention, the level difference sections 20 and 21 are formed in welding cost 16A. The level difference section 20 has the heights 20A and 20B prepared in the front flesh side of front flesh-side welding cost 16A corresponding to the arrangement location of the positive-electrode terminal 12. Heights 20A and 20B are formed by fabricating partially the metallic foil core material 17 of the resin film 15, a protective layer 18, and the welding nature resin layer 19 in the shape of an abbreviation crank so that the positive-electrode terminal 12 may be bypassed.

[0031] On the other hand, when the level difference section 21 also fabricates partially the metallic foil core material 17 of the resin film 15, a protective layer 18, and the welding nature resin layer 19 in the shape of an abbreviation crank corresponding to the arrangement location of the negative-electrode terminal 13, it has the heights 21A and 21B prepared in the front flesh side of front flesh-side welding cost 16A. In these level difference sections 20 and 21, the thickness dimension of the welding nature resin layer 19 which touches the front face of the positive-electrode terminal 12 and the negative-electrode terminal 13, a rear face, and a crosswise both-ends side is set as 30 micrometers or more.

[0032] These heights 20A, 20B, 21A, and 21B are set up so that the difference-of-elevation dimension G to the flat part 22 in welding cost 16A may become more than one half of the thickness dimension of the positive-electrode terminal 12 and the negative-electrode terminal 13. Namely, as for the level difference sections 20 and 21, the difference of the maximum thickness dimension T1 of

each level difference sections 20 and 21 concerned and the minimum thickness dimension of a flat part 22 has become more than the thickness dimension of the positive-electrode terminal 12 and the negative-electrode terminal 13.

[0033] The formation process of welding cost 16A mentioned above in drawing 2 is shown. First, the opening edge of the package 14 for sealing form cells is arranged between the upper metal mold 30 and the Shimokane mold 31 so that welding nature resin layer 19 comrades of the resin film 15 may counter on both sides of the positive-electrode terminal 12 and the negative-electrode terminal 13 (condition of drawing 2 (A)). As for the upper metal mold 30 and the Shimokane mold 31, crevices 32, 33, 34, and 35 are established in each mold face 30A and 31A. These crevices 32, 33, 34, and 35 are established in the location corresponding to the heights 20A, 20B, 21A, and 21B mentioned above, respectively, and it has the depth dimension corresponding to the difference-of-elevation dimension G of Heights 20A, 20B, 21A, and 21B. and warming which does not illustrate the upper metal mold 30 and the Shimokane mold 31 of these -- mold faces 30A and 31A are maintained by predetermined temperature with the means.

[0034] Next, if the upper metal mold 30 and the Shimokane mold 31 are made to approach relatively with the sealing device which is not illustrated, as shown in drawing 2 (B), the welding nature resin layer 19 will carry out a pressure welding to the front flesh side of the positive-electrode terminal 12 and the negative-electrode terminal 13 through a protective layer 18 and the metallic foil core material 17. Under the present circumstances, each welding nature resin layers 19 and 19 start melting with the heat spread through the protective layer 18 and the metallic foil core material 17 from mold faces 30A and 31A.

[0035] And if the upper metal mold 30 and the Shimokane mold 31 are made to approach further as shown in drawing 2 (C), the pressure welding of the interfaces of each welding nature resin layers 19 and 19 will be carried out mutually. Under the present circumstances, being filled with the crosswise both-ends side side of the positive-electrode terminal 12 and the negative-electrode terminal 13, each welding nature resin layers 19 and 19 compressed in the thickness direction by mold face 30A of the upper metal mold 30 and mold face 31A of the Shimokane mold 31 start melting deformation so that it may flow on the front background of the positive-electrode terminal 12 and the negative-electrode terminal 13.

[0036] While the metallic foil core material 17, a protective layer 18, and the welding nature resin layer 19 deform in the shape of an abbreviation crank partially and being fabricated so that it may fill up in crevices 32, 33, and 34 and 35 if the upper metal mold 30 and the Shimokane mold 31 are made to approach further as it is, welding of the interfaces of each welding nature resin layers 19 and 19 is carried out (condition of drawing 2 R> 2 (D)). Under the present circumstances, since the positive-electrode terminal 12 and the negative-electrode terminal 13 are pressed down from the thickness direction both sides in crevices 32, 33, 34, and 35, respectively, they are maintained in the equal center position of crevices 32, 33, 34, and 35 through the metallic foil core material 17, a protective layer 18, and the welding nature resin layer 19, and do not have a possibility that a location gap may arise.

[0037] Moreover, each thickness dimension [as opposed to the front face of the positive-electrode terminal 12 and the negative-electrode terminal 13, a rear face, and a crosswise both-ends side in each welding nature resin layer 19 which covers the positive-electrode terminal 12 and the negative-electrode terminal 13] is 30 micrometers or more. And welding cost 16A of the request by which Heights 20A, 20B, 21A, and 21B were formed in the location corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13 is obtained by making the upper metal mold 30 and the Shimokane mold 31 desert after fixed time amount progress (condition of drawing 2 (E)).

[0038] Since the level difference sections 20 and 21 corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13 are formed in welding cost 16A of the sealing form cell 10 according to the above 1st operation gestalten, if the difference-of-elevation dimension of the level difference sections 20 and 21 is chosen suitably, the thickness dimension of the welding nature resin layer 19 between the positive-electrode terminal 12 and the negative-electrode terminal 13, and the metallic foil core material 17 is securable more than fixed. That is, while not adopting the package 14 for sealing form cells with which the welding nature resin layer 19 was thick-film-ized, miniaturizing and being able to carry out the thinning of the sealing form cell 10 by this like before

in consideration of being thin-film-ized in formation of welding cost 16A according to this 1st operation gestalt, each welding nature resin layer 19 and 19 comrades can be welded certainly, and sufficient airtightness is acquired.

[0039] In order to form the level difference sections 20 and 21 especially by forming Heights 20A, 20B, 21A, and 21B in the front flesh side of welding cost 16A, respectively according to this 1st operation gestalt, At the time of formation of welding cost 16A, it is hard to produce a location gap of the positive-electrode terminal 12 and the negative-electrode terminal 13, and, thereby, the thickness dimension of the welding nature resin layer 19 between the positive-electrode terminal 12 and the negative-electrode terminal 13, and the metallic foil core material 17 can be secured more than fixed certainly.

[0040] Moreover, since the thickness dimension of the welding nature resin layer 19 in the level difference sections 20 and 21 is 30 micrometers or more according to the 1st operation gestalt mentioned above, Even if it is the case where performed blanking to the predetermined plate and the positive-electrode terminal 12 and the negative-electrode terminal 13 are formed, a possibility that the weld flash produced in the periphery of the positive-electrode terminal 12 and the negative-electrode terminal 13 may penetrate the welding nature resin layer 19, and may contact the metallic foil core material 17 can be lessened.

[0041] And since the difference of the maximum thickness dimension T1 of welding cost 16A and the minimum thickness dimension T2 is more than the thickness dimension of the positive-electrode terminal 12 and the negative-electrode terminal 13 according to such a 1st operation gestalt, If thin film-ization of each welding nature resin layers 19 and 19 welded in the flat part 22 is in a slight condition, the thickness of the welding nature resin layer 19 in the level difference sections 20 and 21 is obtained more than fixed, and, thereby, can secure the insulation of the positive-electrode terminal 12 to the metallic foil core material 17, and the negative-electrode terminal 13.

[0042] The 2nd operation gestalt concerning this invention is shown in drawing 3 . In addition, since difference with the 1st operation gestalt mentioned above is the formation process of the level difference sections 20 and 21, i.e., the formation process of welding cost 16A, this 2nd operation gestalt explains only the formation process of welding cost 16A.

[0043] First, the opening edge of the package 14 for sealing form cells is arranged between the upper metal mold 40 and the Shimokane mold 41 so that welding nature resin layer 19 comrades of the resin film 15 may counter on both sides of the positive-electrode terminal 12 and the negative-electrode terminal 13 (condition of drawing 3 (A)). The upper metal mold 40 and the Shimokane mold 41 have the fixed mold faces 40A and 41A and the projecting type sides 40B and 41B, respectively. The fixed mold faces 40A and 41A are arranged in the location corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13. On the other hand, corresponding to the difference-of-elevation dimension G of Heights 20A, 20B, 21A, and 21B, the protrusion of the projecting type sides 40B and 41B is enabled. and warming which does not illustrate the upper metal mold 40 and the Shimokane mold 41 of these -- the fixed mold faces 40A and 41A and the projecting type sides 40B and 41B are maintained by predetermined temperature with the means.

[0044] Next, if the upper metal mold 40 and the Shimokane mold 41 are made to approach relatively with the sealing device which is not illustrated, as shown in drawing 3 (B), the welding nature resin layer 19 will carry out a pressure welding to the front flesh side of the positive-electrode terminal 12 and the negative-electrode terminal 13 through a protective layer 18 and the metallic foil core material 17. Under the present circumstances, each welding nature resin layers 19 and 19 start melting with the heat spread through the protective layer 18 and the metallic foil core material 17 from the fixed mold faces 40A and 41A and the projecting type sides 40B and 41B.

[0045] And while the metallic foil core material 17, a protective layer 18, and the welding nature resin layer 19 will deform in the shape of an abbreviation crank partially if the projecting type sides 40B and 41B are made to project to the fixed mold faces 40A and 41A as shown in drawing 3 (C) Melting deformation is carried out so that it may be thin-film-ized while each welding nature resin layers 19 and 19 carry out the pressure welding of the interfaces mutually, and it may be filled with the crosswise both-ends side side of the positive-electrode terminal 12 and the negative-electrode terminal 13 by the amount of [of each welding nature resin layers 19 and 19] surplus. Under the

present circumstances, since the positive-electrode terminal 12 concerned and the negative-electrode terminal 13 are arranged in the center of the direction of a field of the projecting type sides 40B and 41B if it puts in another way, since the fixed mold faces 40A and 41A are arranged in the location which corresponds, respectively, the positive-electrode terminal 12 and the negative-electrode terminal 13 are maintained in the equal center position of the fixed mold faces 40A and 41A, and do not have a possibility that a location gap may arise.

[0046] Moreover, each thickness dimension [as opposed to the front face of the positive-electrode terminal 12 and the negative-electrode terminal 13, a rear face, and a crosswise both-ends side in each welding nature resin layer 19 which covers the positive-electrode terminal 12 and the negative-electrode terminal 13] is 30 micrometers or more. And welding cost 16A of the request by which Heights 20A, 20B, 21A, and 21B were formed in the location corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13 is obtained by making the upper metal mold 40 and the Shimokane mold 41 desert after fixed time amount progress (condition of drawing 3 (D)).

[0047] According to such a 2nd operation gestalt, like the 1st operation gestalt mentioned above, since the level difference sections 20 and 21 corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13 are formed in both sides of welding cost 16A of the sealing form cell 10, while miniaturizing and being able to carry out the thinning of the sealing form cell 10, each welding nature resin layer 19 and 19 comrades can be welded certainly, and sufficient airtightness is acquired.

[0048] And in order to form the level difference sections 20 and 21 in formation of welding cost 16A by making the projecting type sides 40B and 41B project to the fixed mold faces 40A and 41A of the upper metal mold 40 and the Shimokane mold 41 according to the 2nd operation gestalt mentioned above, If the protrusion dimension of the projecting type sides 40B and 41B over the fixed mold faces 40A and 41A is chosen suitably, the difference-of-elevation dimension of each heights 20A, 20B, 21A, and 21B can be set as arbitration. That is, according to this 2nd operation gestalt, it can respond flexibly to the sealing form cell of other classes by which the cross-section configuration of the positive-electrode terminal 12 and the negative-electrode terminal 13 differs from a cross-section dimension separately.

[0049] In addition, this invention is not limited to each operation gestalt mentioned above, proper deformation, amelioration, etc. are possible for it, and the gestalt shown in drawing 4 and drawing 5 is also included in this invention. That is, when sealing form cell 10A shown in drawing 4 forms Heights 20A and 21A only in one side corresponding to the positive-electrode terminal 12 and the negative-electrode terminal 13 in welding cost 46A, the level difference sections 40 and 41 are formed. In this case, as for Heights 20A and 21A, it is desirable to form in the field which does not affect the maximum thickness dimension of sealing form cell 10A.

[0050] Moreover, when sealing form cell 10B shown in drawing 5 forms heights 21A in one side corresponding to the negative-electrode terminal 13 in welding cost 56A, while the level difference section 51 is formed, the level difference section 40 is formed by forming heights 20A in other fields corresponding to the positive-electrode terminal 12.

[0051] And in each operation gestalt mentioned above, although the sealing form cell which adopted cross-section rectangle-like a positive-electrode terminal and a negative-electrode terminal was illustrated, sealing form cell 10A which adopted the positive-electrode terminal 62 and the negative-electrode terminal 63 which are shown in drawing 6 is also contained in this invention. That is, as shown in drawing 6 (A) and drawing 6 (B), the positive-electrode terminal 62 and the negative-electrode terminal 63 make the compression set of the bar 67 of a predetermined metal carry out in the direction of a path with the press metal mold 18 and 19, and are formed in the shape of a cross-section abbreviation ellipse. And as shown in drawing 6 (C), when sealing form cell 10A forms the heights 70A, 70B, 71A, and 71B of a cross-section abbreviation half ellipse configuration in both sides of welding cost 76A corresponding to the cross-section configuration of the positive-electrode terminal 62 and the negative-electrode terminal 63, the level difference sections 70 and 71 are formed.

[0052] Since the positive-electrode terminal 62 and the negative-electrode terminal 63 to which the compression set of the metal bar 67 was made to carry out in the direction of a path are adopted according to this sealing form cell 10A, it is not necessary to take into consideration the weld flash

produced in the periphery of the positive-electrode terminal 62 and the negative-electrode terminal 63. Therefore, since the resin film 64 thin-film-ized in the welding nature resin layer 19 is employable according to such sealing form cell 10A, it can do small, and thereby, further, it miniaturizes and the thinning of the total thickness dimension can be carried out.

[0053] In addition, if this invention can be attain, the quality of the material of the generation of electrical energy element illustrated in each operation gestalt mentioned above, a positive electrode terminal, a negative electrode terminal, the package for sealing form cells, a welding nature resin layer, welding cost, the level difference section, metal mold, a crevice, a fixed mold face, a projecting type side, etc., a configuration, the dimension, the gestalt, the number, the arrangement part, etc. will be arbitrary, and will not be limit.

[0054] Next, two or more kinds of sealing form cells manufactured so that the relation of the thickness dimension of the level difference section and the thickness dimension of a flat part in welding cost might be based on this invention are made into an example 1 thru/or an example 3. The result investigated about the short circuit of a positive-electrode terminal and a negative-electrode terminal is shown in Table 1 by making into the example 1 of a comparison the sealing form cell manufactured so that the relation between the thickness dimension of the level difference section and the thickness dimension of a flat part might separate from the specific range of this invention.

[0055]

[Table 1]

	試料1	試料2	試料3	試料4	平均
A部のバリ高さ寸法(μm)	14.0	14.0	19.0	19.0	16.5
B部のバリ高さ寸法(μm)	14.0	19.0	19.0	19.0	17.8
C部のバリ高さ寸法(μm)	19.0	19.0	24.0	19.0	20.3
D部のバリ高さ寸法(μm)	14.0	19.0	21.0	19.0	18.3
平均	15.3	17.8	20.8	19.0	18.2

[0056] In addition, in advance of this investigation, as shown in two or more draws and drawing 7 (A), the height dimension of weld flash [in / for the sample of the shape of a cross-section rectangle formed of blanking from predetermined foil material / four crosswise edges (a, b, c, d)] was measured. As shown in drawing 7 (B), the height dimension of weld flash points out the difference of the thickness dimension of sample original, and the observation maximum thickness dimension of a terminal. The height dimension of the weld flash in each of these samples is shown in Table 2.

[0057]

[Table 2]

	実施例1	実施例2	実施例3	比較例1
端子の厚み寸法（μm）	１００	１００	１００	１００
段差部の厚み寸法(μm)	３２７	３４１	２６６	２３３
平坦部の厚み寸法(μm)	１５８	１５６	１６３	１６４
端子同士の短絡	無	無	無（条件付）	有
段差部の融着強度	優	良	可	不良
総合評価	◎	○	△	×

[0058] The total thickness dimension of the resin film which returned to Table 1 and was used for the example 1 thru/or the example 3, and the example 1 of a comparison is 140 micrometers, and the presentation is the same as that of the 1st operation gestalt fundamentally mentioned above. and these examples 1 thru/or an example 3, and the example 1 of a comparison -- thickness dimension the positive-electrode terminal and negative-electrode terminal which are 100 micrometers -- inserting -- front face of a mold face the upper metal mold and the Shimokane mold which were maintained at 190 degrees C -- the pressure of 1Mpa -- 1 second -- or you made it stuck by pressure for 60 seconds, and welding cost was formed.

[0059] And while these examples 1 do not exist, reaching example 3, attaching example of comparison 1 and evaluating the existence of a short circuit of a positive-electrode terminal and a negative-electrode terminal In order to check airtightness, the welding reinforcement of the welding nature resin layer to a positive-electrode terminal and a negative-electrode terminal was evaluated to four steps of A, good, good, and a defect, and based on these evaluations, comprehensive evaluation was evaluated to four steps of O-O-**-x.

[0060] (Example 1) While the thickness dimension of the level difference section was 327 micrometers, the thickness dimension of a flat part was set to 158 micrometers. In this example 1, while there was no short circuit of a positive-electrode terminal and a negative-electrode terminal, evaluation of welding reinforcement was "A" and comprehensive evaluation was "O." Even if the sticking-by-pressure time amount of upper metal mold and the Shimokane mold was 60 seconds or more, the short circuit of a positive-electrode terminal and a negative-electrode terminal did not produce this example 1.

[0061] (Example 2) While the thickness dimension of the level difference section was 341 micrometers, the thickness dimension of a flat part was set to 156 micrometers. In this example 2,

while there was no short circuit of a positive-electrode terminal and a negative-electrode terminal, evaluation of welding reinforcement was "good" and comprehensive evaluation was "O." Even if the sticking-by-pressure time amount of upper metal mold and the Shimokane mold was 60 seconds or more, the short circuit of a positive-electrode terminal and a negative-electrode terminal did not produce this example 2, either.

[0062] (Example 3) While the thickness dimension of the level difference section was 266 micrometers, the thickness dimension of a flat part was set to 163 micrometers. In this example 3, while there was no short circuit of a positive-electrode terminal and a negative-electrode terminal, evaluation of welding reinforcement was "good" and comprehensive evaluation was "**." In addition, since the short circuit of a positive-electrode terminal and a negative-electrode terminal generated this example 3 as the sticking-by-pressure time amount of upper metal mold and the Shimokane mold is 20 seconds or more, comprehensive evaluation became "**."

[0063] (Example 1 of a comparison) While the thickness dimension of the level difference section was 233 micrometers, the thickness dimension of a flat part was set to 164 micrometers. In this example 1 of a comparison, even if the sticking-by-pressure time amount of upper metal mold and the Shimokane mold was about 5 seconds, while the positive-electrode terminal and the negative-electrode terminal short-circuited, since a welding nature resin layer thin-film-ized and sufficient welding reinforcement was not obtained, evaluation of welding reinforcement was a "defect", and comprehensive evaluation was "x."

[0064] In this table 1, since an example 1 thru/or an example 3 are guessed that the thickness dimension of the welding nature resin layer between the positive-electrode terminal and negative-electrode terminal in the level difference section, and a metallic foil core material is 30 micrometers or more from the relation between the thickness dimension of the level difference section, and the thickness dimension of a flat part, respectively, it is understood that each evaluation is high as compared with the example 1 of a comparison. Since especially an example 1 and an example 2 were guessed that the thickness dimension of the welding nature resin layer in the level difference section is 50 micrometers or more, as compared with the example 3, the short circuit of a positive-electrode terminal and a negative-electrode terminal could attain them unconditionally, and, thereby, they became high evaluation. And the thickness dimension of the welding nature resin layer in the level difference section an example 1 Since it is guessed that it is 100 micrometers or less, it turns out that it contributes to the miniaturization of a sealing form cell, and thinning as compared with an example 2.

[0065] this invention from the above thing -- setting -- the thickness dimension of a welding nature resin layer -- 30 micrometers or more -- desirable -- further -- desirable -- 50 micrometers or more -- much more -- desirable -- It turns out that it is 100 micrometers or less.

[0066]

[Effect of the Invention] As mentioned above, while according to this invention the thickness dimension of the welding nature resin layer between a terminal and a metallic foil core material is securable more than fixed, and miniaturizing and being able to carry out the thinning of the sealing form cell by this since the level difference section corresponding to a terminal is prepared in welding cost as indicated to claim 1 and claim 5 as explained, each welding nature resin layers can be welded certainly, and sufficient airtightness is acquired.

[0067] Moreover, since according to this invention the level difference section is prepared in both sides of welding cost as indicated to claim 2 and claim 6, it is hard to produce a location gap of a terminal at the time of formation of welding cost, and, thereby, the thickness dimension of the welding nature resin layer between a terminal and a metallic foil core material can be secured more than fixed certainly.

[0068] Furthermore, according to the sealing form cell of this invention, even if it is the case where the terminal of thin meat which is used for a sealing form cell is formed by blanking since the thickness dimension of the welding nature resin layer in the level difference section is 30 micrometers or more as indicated to claim 3, the short circuit of each terminal in the weld flash produced in the periphery of a terminal can be prevented. And since according to the sealing form cell of this invention the difference of the maximum thickness dimension of welding cost and the minimum thickness dimension is more than the thickness dimension of a terminal as indicated to

claim 4, the thickness of the welding nature resin layer in the level difference section can secure more than fixed, and, thereby, the insulation of the positive terminal to a metallic foil core material is acquired.

[0069] Moreover, if the protrusion dimension of a projecting type side is suitably chosen in order to form the convex level difference section at least in one side of welding cost by making a projecting type side project from a mold face according to the manufacture approach of the sealing form cell of this invention, as indicated to claim 7, it can respond flexibly to the sealing form cell of other classes by which the cross-section configuration of each terminal differs from a cross-section dimension separately.

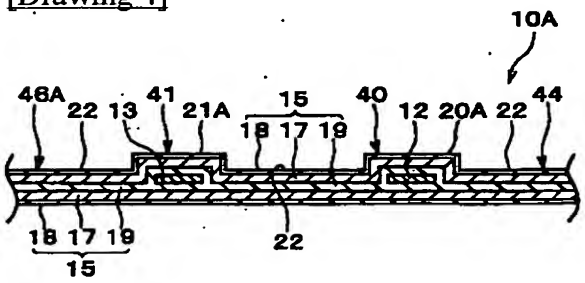
[Translation done.]

* NOTICES *

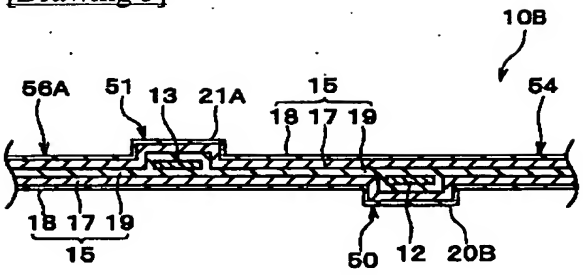
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 4]

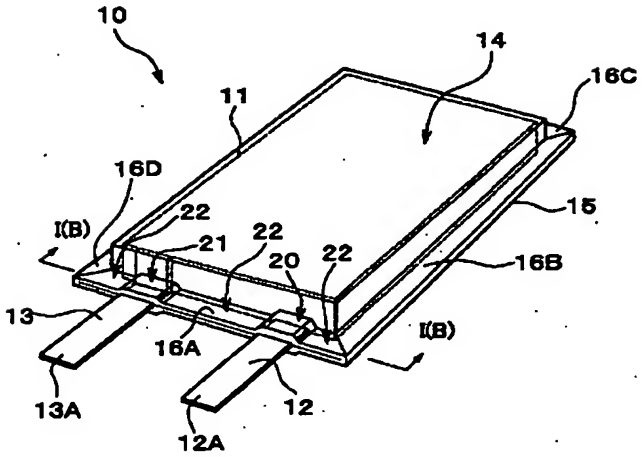


[Drawing 5]



[Drawing 1]

(A)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16C
11
16D
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I(B)
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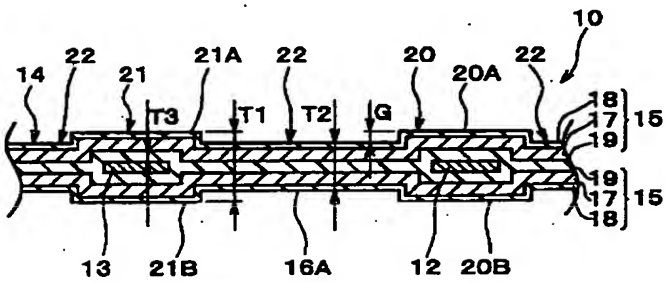
12
12A

(B)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14
22
21
21A
22
20
20A
22
T3
T1
T2
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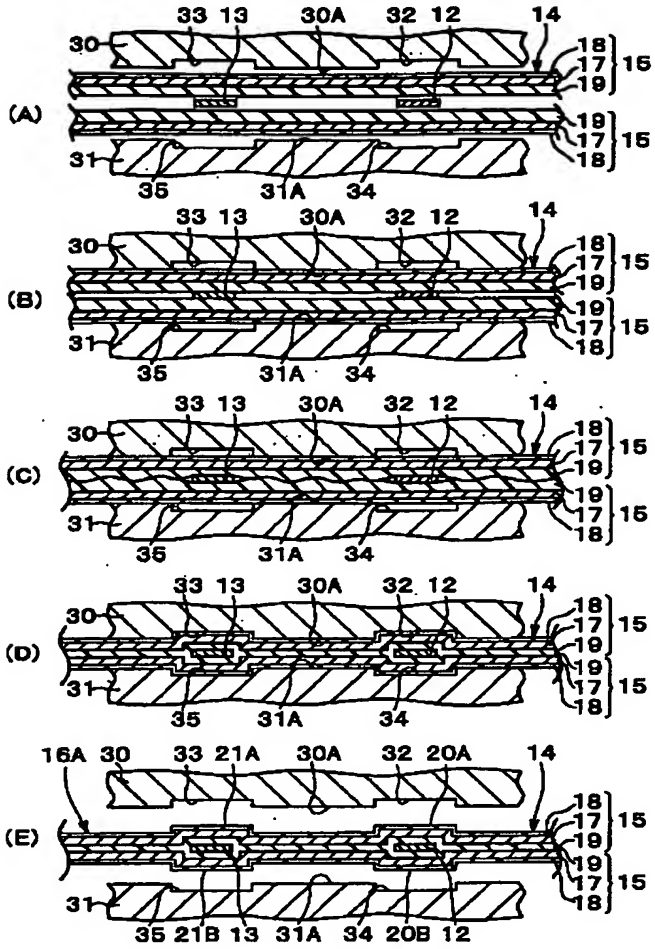
15
13
21B
16A
12
20B

[Drawing 2]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(E)
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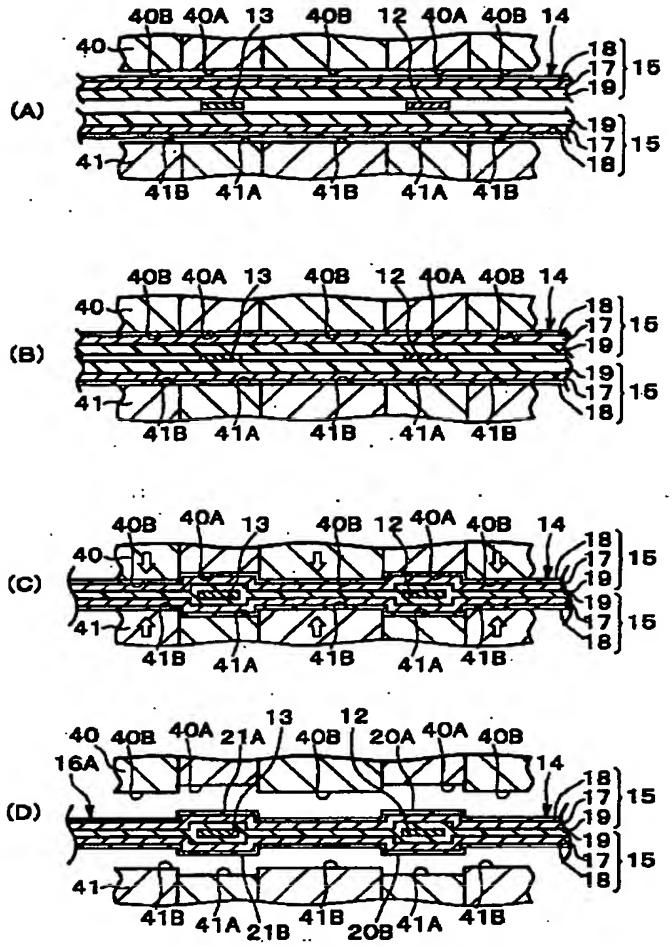
35 21B 13 31A 34 20B 12

[Drawing 3]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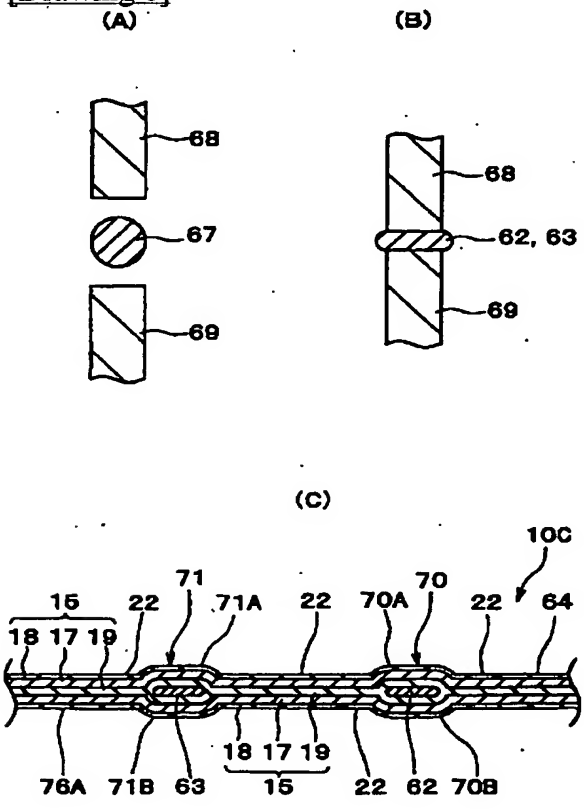
[Drawing 6]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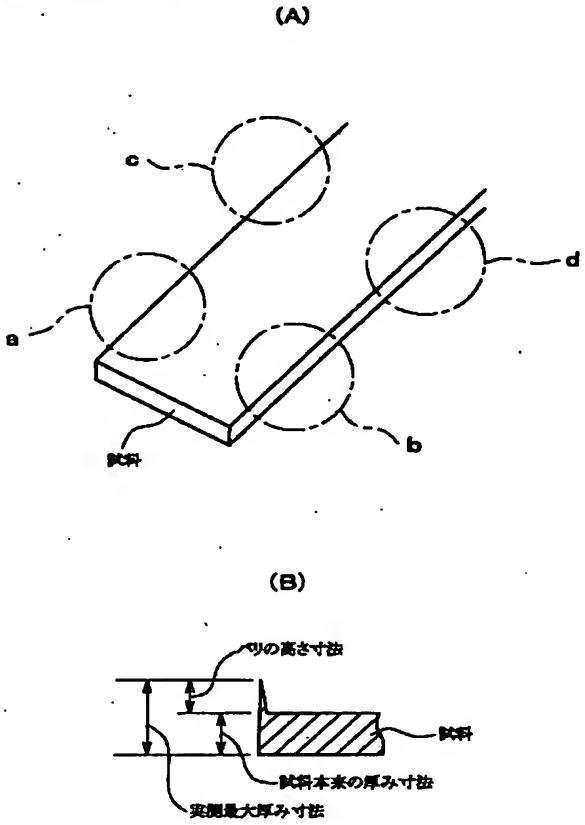
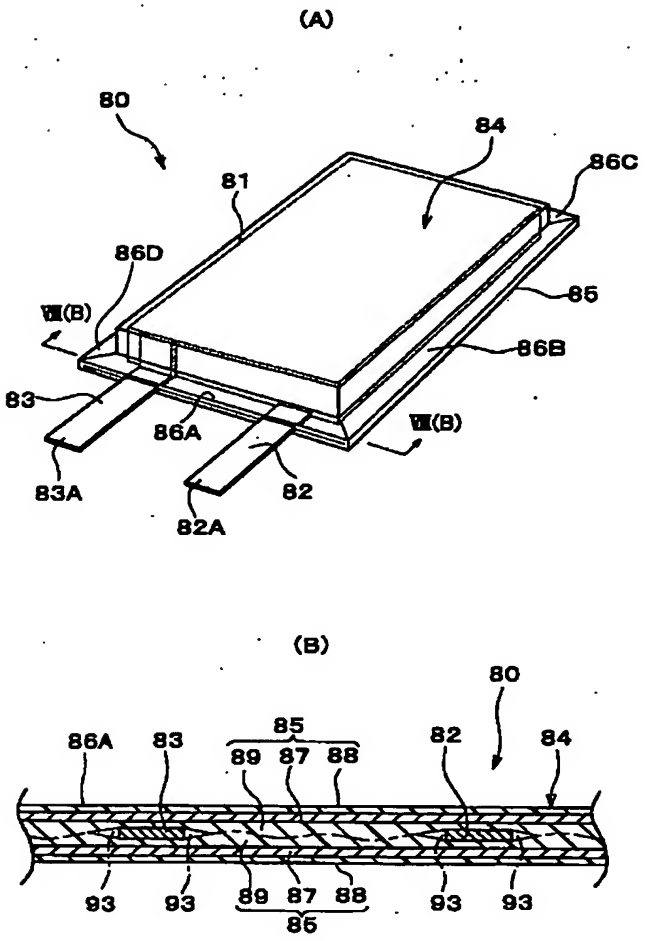
70B

[Drawing 7]



[Drawing 8]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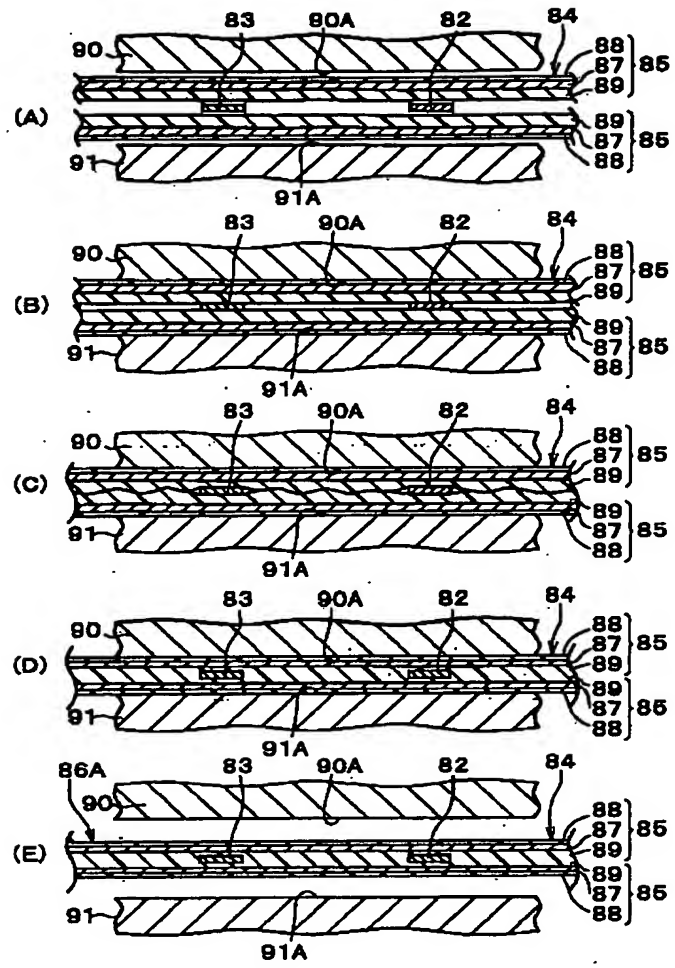
[Drawing 9]



[Translation done.]